VOLUME XXVII MARCH 1934 NUMBER 3

# Southern Medical Journal

## Journal of the Southern Medical Association

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $4.00. Entered as Second-Class Matter at the Post Office at Birmingham, Ala., under act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Sec. 1103, Act of March 3, 1917, authorized Dec. 20, 1921.

Southern Medical Association, Twenty-Eighth Annual Meeting, San Antonio, Texas, November 13-16

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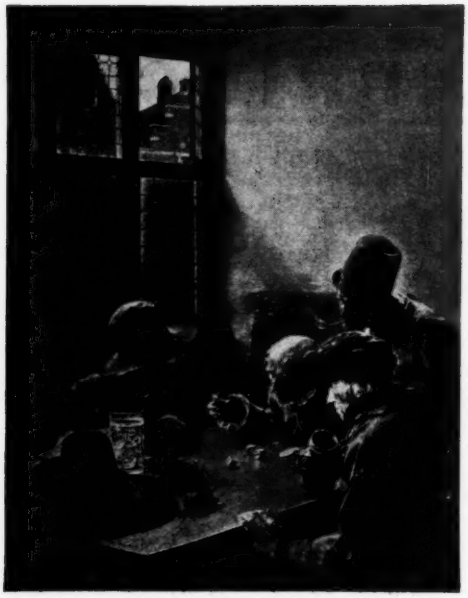

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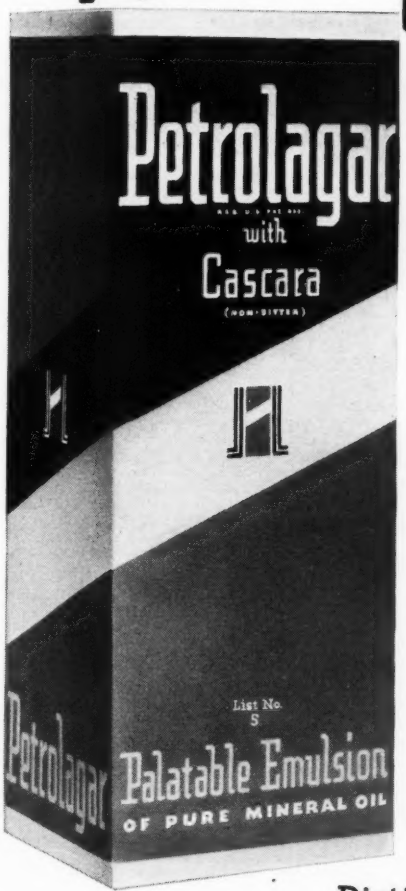


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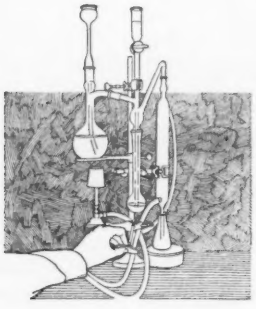

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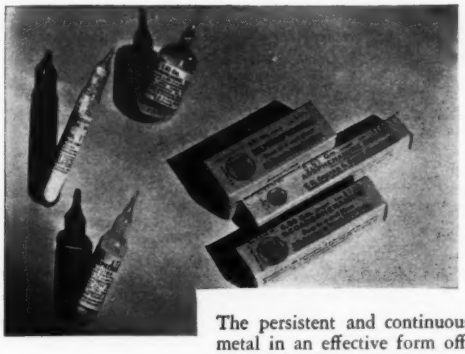

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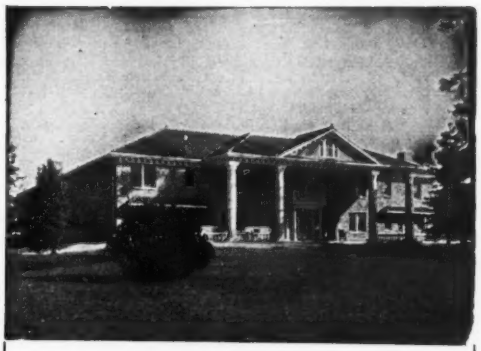

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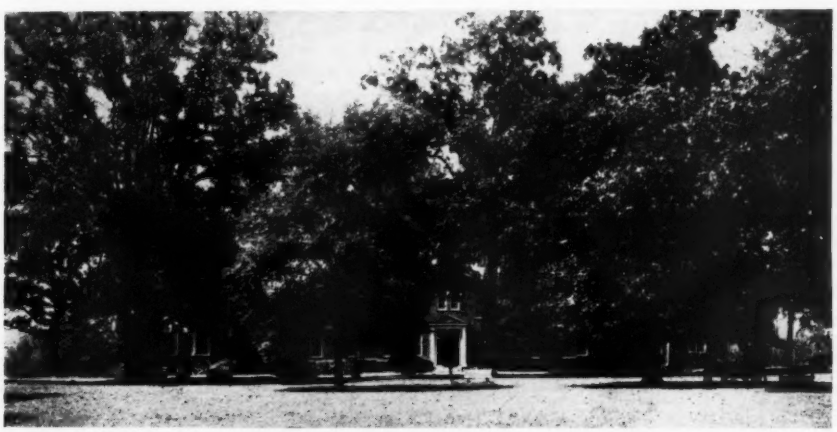

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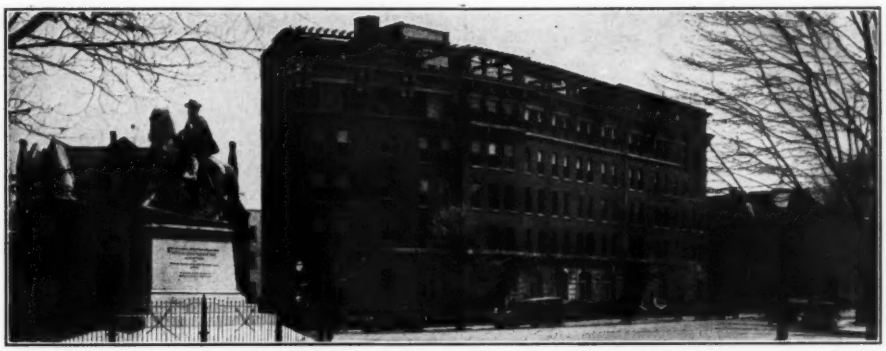

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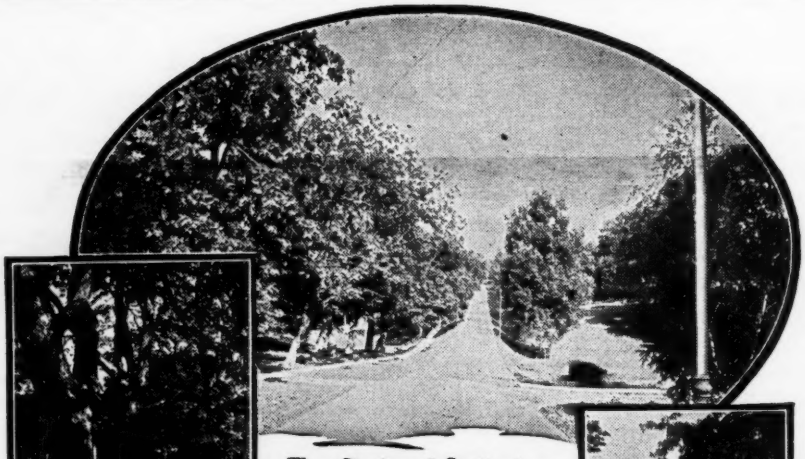

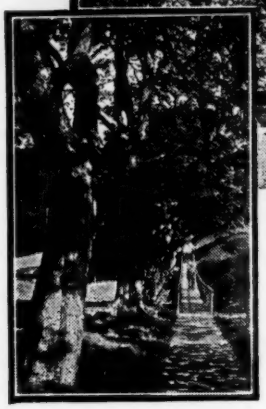

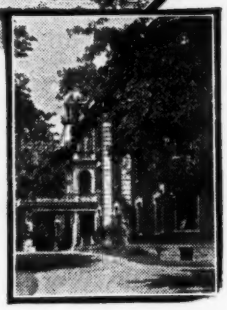

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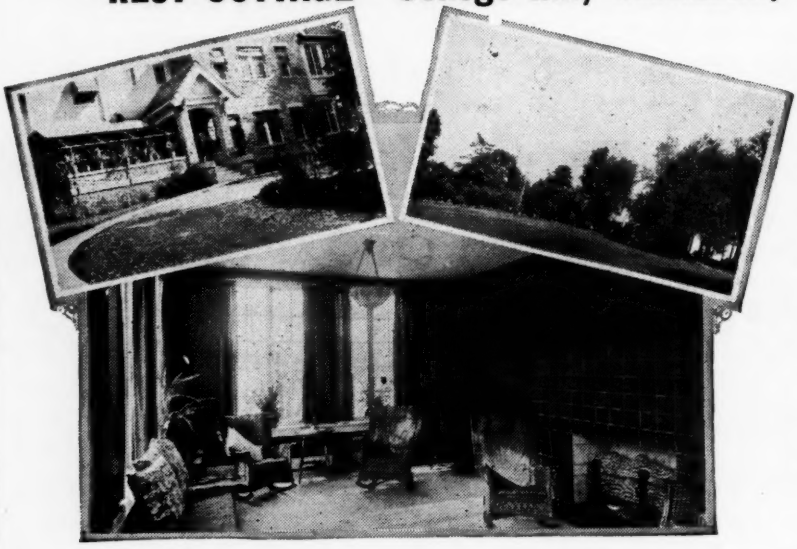

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## JOURNAL OF THE SOUTHERN MEDICAL ASSOCIATION

PUBLISHED MONTHLY BY THE SOUTHERN MEDICAL ASSOCIATION AT BIRMINGHAM, ALA.

Volume XXVII MARCH 1934 Number 3


## THE VALUE OF RADIOLOGY TO THE THORACIC SURGEON*


*By* ALTON OCHSNER, M.D.,
New Orleans, Louisiana


Much was known of the morbid anatomy and the clinical manifestations of lesions within the thorax before the introduction of roentgenography by Roentgen in 1895, and one cannot say that without roentgenography thoracic surgery would not have progressed. No one can deny, however, that without the possibility of visualizing the intrathoracic viscera fluoroscopically and studying the detail of changes from the normal by means of the roentgen ray, the early diagnosis of and the study of the progression of intrathoracic lesions would be limited. Even today a great deal can be ascertained in the diagnosis of intrathoracic lesions by the use of ordinary methods of physical examination, and it is certainly not my intention to decry their value. I believe, however, that there is possibly a tendency, especially among medical students, to rely too much upon all methods of laboratory examination, including the x-ray, and not enough upon physical examination. I do not mean that the reliance upon laboratory methods is dangerous, but in so doing the student of medicine frequently loses the opportunity of training himself in physical examination and does not become so proficient in this method of diagnosis as his predecessors were. There are also times when the physical examination and the general consideration of the patient are even more valuable than the laboratory findings. Ideally, a correlation of all findings should be obtained.

Roentgenography of the thorax is especially valuable because of the normal differences in densities which occur in the thorax, that is, the contrast between the air-containing lungs and the relatively opaque mediastinal structures. Both methods of roentgen examination, fluoroscopy and roentgenography, are of inestimable value to the thoracic surgeon. The former, although lacking in detail, demonstrates the functional activity of the intrathoracic viscera, especially the movements of the heart, great vessels, and diaphragm; and the latter, although a still photograph, unable to show changes in function, is indispensable because it visualizes the detailed and minute changes in the intrathoracic viscera. The thoracic surgeon, in contrast to the internist, is not only interested in the character, density, size and shape of an intrathracic lesion, but also its location; because before any surgical approach can be planned, it is imperative that the lesion be accurately localized.

As in the diagnosis of fractures, a single roentgenogram obtained in one plane is of little value for localization. It is necessary in roentgenography of the thorax that additional plates be taken, but there is some variance of opinion concerning the relative values of lateral, oblique and stereoroentgenograms. Whenever possible, six-foot plates should be obtained, because only in this way can a true value of the size of the lesion be ascertained. It is perfectly obvious that a lesion situated in the posterior mediastinum will appear larger in a postero-anterior roentgenogram with the patient's thorax against the plate than in an antero-posterior roentgenogram with the patient's back against the plate. In antero-posterior and postero-anterior teleoroentgenograms, however, there is little difference in the size, density, and location of shadows. Also by means of the long distance plate it is easier to duplicate roentgenograms, which is of utmost importance in following intrathoracic lesions. In so doing the relative positions of the plate, the patient, and the central x-ray beam should be the same in each roentgenogram, as in this way no distortion will result. The chance of distortion of a shadow is much greater in roentgenograms taken at short distances (Roberts[1]).

*Read in Section on Radiology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

*From the Department of Surgery, Tulane University School of Medicine, New Orleans.

There is considerable difference of opinion concerning the relative value of stereoroentgenograms and lateral roentgenograms. Personally, I do not believe that either will ever supplant the other. By means of clear-cut stereoroentgenograms one can accurately determine the relative position of an intrathoracic lesion, which is necessary before an operative approach can be planned by the thoracic surgeon. On the other hand, a lateral roentgenogram will not only show the relative position of the lesion, but also its relation to the normal intrathoracic structures. The detail, however, is not quite so definite as in the stereoroentgenogram. It becomes evident, therefore, that each should be used to supplement the other and that in no instance should reliance be placed upon only one of these complementary plates. Oblique roentgenograms are of value, especially in studying lesions of the esophagus. They are, however, more difficult to read, and considerable experience is required for their interpretation. Lesions of the pleura and thoracic wall occasionally can be definitely demonstrated roentgenologically following the production of a diagnostic artificial pneumothorax. The separation of the visceral and parietal layers of the pleura by air introduced into the pleural cavity will plainly demonstrate the location of the lesion, whether attached to the parietal or visceral pleura, as well as more definitely visualize the lesion because of the marked contrast between the less dense, air-containing pleural space and the intrathoracic lesion. A diagnostic artificial pneumothorax is, therefore, justified in cases in which it is difficult to localize the lesion, especially in those situated in the periphery of the lung or the parietal pleura.

There has been some controversy among radiologists concerning the cause of the hilar shadows in normal and diseased lungs. It is quite generally agreed at the present time that in the normal lung the hilar shadows extending peripherally and becoming decreasingly dense toward the periphery are caused by the vessels and not by bronchi. Chaoul and Stierlin[2] have quite definitely demonstrated this to be a fact. They found that these shadows became more distinct when the lung was overdistended with air by positive pressure. By increasing the intrapulmonary pressure they were able to dilate the bronchial tree and decrease the resistance of the contents of the bronchi to the roentgen ray and at the same time produce a greater contrast between the bronchi and the vessels which stood out in bolder relief.

In contrast to the normal lung, radiating shadows extending from the hilum toward the periphery may be the result of infiltration and thickening of the bronchial wall. This is especially true in bronchiectasis, although the making of a diagnosis of bronchiectasis on the roentgen film without filling the bronchi with a contrast substance is unreliable and entirely unnecessary, because of the ease and safety with which contrast substances can be introduced into the bronchi. Since the pioneer work of Chevalier Jackson,[3 4] in 1905, in which roentgen visualization of the bronchi was obtained by insufflating bismuth oxide through the bronchoscope into the tracheobronchial tree, bronchography has become a valuable and indispensable procedure. At the present time iodized oil, because of its lack of irritation and because of the ease with which it can be introduced, is the contrast substance commonly employed. A number of methods of introducing the iodized oil into the tracheobronchial tree have been suggested and are being used. The "passive" technic of bronchography is the simplest and the most successful method of introducing an opaque oil into the bronchi and as it requires no special training it is the method of choice for the roentgenologist. This technic, which has been described in previous publications, [5 6 7 8 9] in short consists of abolishing the swallowing reflex by anesthetizing the anterior surface of the tonsillar pillars with 10 per cent cocaine. The oil then taken into the mouth cannot be swallowed, but is aspirated into the tracheobronchial tree. In performing a bronchography it is imperative that it be done in the x-ray room, and it is highly desirable that fluoroscopic observations be made immediately after the filling. This is of importance in order more definitely to visualize the introduction of the oil and to determine the presence or absence of bronchial dilatation before a sufficient quantity of the oil has gotten into the alveoli to overshadow the bronchial filling. Antero-posterior stereoroentgenograms and lateral roentgenograms are then made of the thorax. It is important to use sufficient voltage to "burn out" the lung detail, as in this way the shadows produced by the oil-filled bronchi stand out in bolder relief. It is my custom to perform the original bronchography by having the patient aspirate the oil in the erect position. Almost invariably the oil will gravitate into the side with the greatest involvement, which in the majority of instances is in the left lower lobe. At a subsequent filling the opposite lower lobe is filled in order to rule out any diseased process in that particular segment. This

is easily accomplished by having the patient lean, during the aspiration of the oil, toward the side which one desires to fill.

Frequently only by bronchography can one differentiate a localized pulmonary suppuration, that is, pulmonary abscess, from the diffuse process, bronchiectasis. Clinically the two conditions may be indistinguishable. The symptoms, expectoration, and clinical course may be identical. As a rule, however, the previous history is of value in distinguishing the two conditions, pulmonary abscess, usually following a recent pneumonic infection, or some operation, especially upon the upper respiratory tract. As a rule, also, a patient with a localized pulmonary suppuration, such as abscess, is considerably sicker than a patient with a bronchiectasis in whom absorption is much less rapid. This is due to the fact that accompanying lung abscess there is almost invariably, especially in the early stages, an area of pneumonitis, and it is the pneumonitis, together with the central area of necrosis, which is responsible for the absorption of toxins and in turn the production of symptoms. Most, if not all, cases of pulmonary abscess begin as an area of localized pneumonitis, which cannot be distinguished clinically or roentgenologically from a pneumonic process and which, in fact, does not differ pathologically from such a case. As the case progresses, however, central necrosis occurs and as soon as there is a communication between the abscess cavity and the bronchus, the abscess will contain air, which can be demonstrated roentgenologically. If both air and fluid are present (as is usually the case), a fluid level can be shown by means of the x-ray. The finding of a fluid level in such a case with pyrexia and expectoration of foul material, especially in a patient who has recently had pneumonia or an operation upon the upper respiratory tract, is pathognomonic of a pulmonary abscess. An intrathoracic fluid level may at times result from a localized pyopneumothorax. However, if the area of consolidation with cavitation is located mesially in the lung field, the diagnosis of lung abscess is definite. Unfortunately, not all cases of lung abscess communicate with the bronchus and cavitation is not visible. In Neuhof and Wessler's[10] series of cases, approximately only half had roentgenograms typical of pulmonary abscess. A bronchography is of value in distinguishing between lung abscess and bronchiectasis, because, as mentioned above, the two conditions clinically may be almost indistinguishable. The abscess cavity in lung abscess fills with difficulty with the contrast substance, because usually the opening between the cavity and the bronchus is small and it is apt to be plugged by granulation tissue. The filling of the abscess cavity is best accomplished following aspiration of the purulent contents of the cavity bronchoscopically and the introduction of a contrast substance directly into the cavity at the time of the bronchoscopic drainage. As suggested by Chaoul and Stierlin,[2] it is desirable in cases of lung abscess communicating with a bronchus to obtain two plates, one before and another after emptying the abscess by postural drainage. In this way the size, contour and situation of the abscess can be better visualized. Characteristically the inflammatory zone around the abscess cavity decreases and becomes less marked roentgenologically as the condition becomes more chronic. This is due to the fact that the wide inflammatory zone decreases as the infection subsides. The inflammatory zone, however, persists in cases of pyogenic infection and is of importance in differentiating the pyogenic abscess from a tuberculous cavity in which the wall is much less marked than in the pyogenic abscess.

A pulmonary abscess occurring in an elderly individual, especially without an antecedent history of pneumonia or a previous operation, must be considered as originating in a carcinoma until proven otherwise. This is especially true if there is atelectasis of the lung distal to the area involved. As in carcinoma elsewhere, central necrosis occurs as the result of cutting off the blood supply. In the lung, as in the intestine and on the skin, because of the ever-present micro-organisms, infection occurs and it is frequently impossible to distinguish between the ordinary pyogenic abscess and one engrafted on a malignant lesion. In those abscesses located peripherally, especially if an atelectasis of the involved area is present, the most probable diagnosis is malignancy with secondary suppuration. A definite diagnosis can be made on bronchoscopic examination and biopsy. The importance of accurate localization of localized pulmonary suppuration is especially great in those cases in which external drainage is indicated or becomes necessary. Fortunately, the majority of postoperative pulmonary abscesses, most of which are aspiratory in origin, and practically all of the spirochetal infections of the lung are amenable to conservative treatment, external drainage not being indicated. In those cases, however, in which external drainage is imperative, because of persistence of infection and incomplete evacuation through the bronchus, it is of utmost importance that an accurate localiaation be made preoperatively in order that drain-

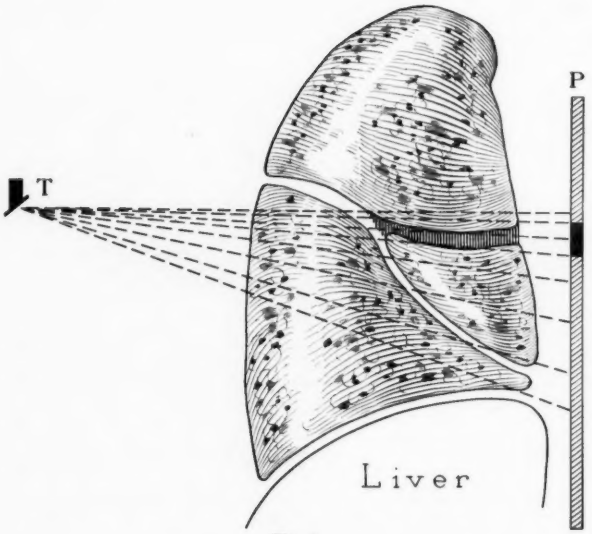


Fig. 1

(Modified after Chaoul and Stierlin) Diagrammatic drawing illustrating the sharply defined shadow produced by an interlobar effusion between the upper and middle lobes when the postero-anterior roentgenogram is made in the usual manner.

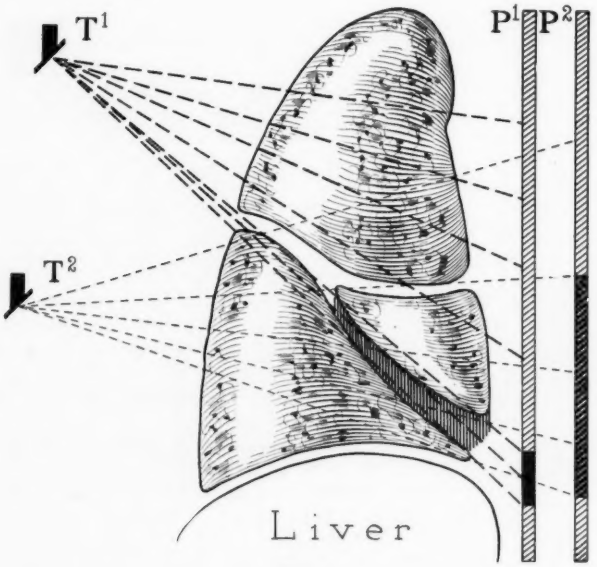


Fig. 2

(Modified after Chaoul and Stierlin) Diagrammatic drawing illustrating the correct way of obtaining a roentgenogram in cases of pleural effusion between the lower and middle pulmonary lobes. A postero-anterior roentgenogram (P2) taken in the ordinary manner results in a diffuse, ill-defined shadow, because the roentgen rays from T2 do not parallel the surface of the effusion. If, however, the position of the tube (T1) is altered so that the roentgen rays parallel the surface of the fluid, a sharply defined, narrow shadow will be produced on the roentgen plate (P1).

age of the cavity may be accomplished by the most direct route. Here stereoroentgenograms, together with lateral and oblique plates, are of inestimable value. If it is impossible to obtain a six-foot plate, it is important that the plate be obtained in such a way that the abscess is closest to the film, that is, in those located posteriorly that an antero-posterior roentgenogram with the patient's back against the plate be made. In this way the shadow cast by the abscess is sharper and smaller because of the closer proximity of the abscess to the plate. A more correct conception of the size and position of the abscess is thus obtained.

Atelectasis of the lung is an important postoperative complication, and whereas massive atelectasis can, as a rule, be suspected and is usually diagnosed clinically, roentgenography is indispensable in detecting the less advanced and earlier cases. This condition, which was first adequately described by the Englishman, Pasteur,[11] in 1890, has only relatively been sufficiently appreciated by clinicians. As shown by Pasteur,[12 13 14] Manges[15] and others,[16 17] the typical and pathognomonic finding which can be demonstrated clinically and roentgenologically is a shifting of the mediastinum with its contained structures toward the affected side. Traube,[18] in 1846, and Lichtheim,[19] in 1879, showed that experimental bronchial obstruction with absorption of the air distal to the point of obstruction would result in atelectasis of the involved lobe. It has been recently shown by Van Allen[20 21] that unless accompanied by an inflammatory process, an intralobar obstruction will not result in atelectasis because of an intralobar collateral respiration. In the presence of inflammation collateral respiration is so interfered with that an intralobar obstruction may result in atelectasis. The investigations of Van Allen[20 21] illustrate

why more cases of atelectasis are not encountered postoperatively.

The roentgen examination in cases of empyema is of great diagnostic and prognostic value. Especially in cases of children the recognition clinically of empyema is difficult, and frequently only by the use of roentgenography can an early diagnosis be made. Even though the pleural cavity normally is a large, potential single space, encapsulation in the presence of infection is apt to occur, resulting in a localized empyema. A total empyema with involvement of the entire cavity is seldom encountered. The accurate localization by means of x-ray films of an empyemic process is necessary in order that aspiration or drainage may be accomplished without danger of contaminating uninvolved portions of the pleural cavity. Roentgenography is of greatest value in localized infections between the lobes of the lung, the interlobar empyemas, because these lesions exhibit few or no physical signs. Unless special roentgen technic is employed to demonstrate interlobar collections of fluid, they may not be correctly diagnosed. In visualizing interlobar fluid collections roentgenologically it is important that the rays parallel the surface of the fluid and not strike the surface perpendicularly, as they frequently do when an antero-posterior roentgenogram is made. If the roentgen rays strike the surface of the fluid perpendicularly, the resulting shadow is not clear nor diagnostic of an interlobar empyema. Lateral roentgenograms and roentgenograms taken with the tube and plate placed in such positions that the rays parallel the surface of the fluid in suspected cases of interlobar effusion are of diagnostic value and by means of these a positive diagnosis can almost invariably be made (*Figs. 1, 2* and *3*).

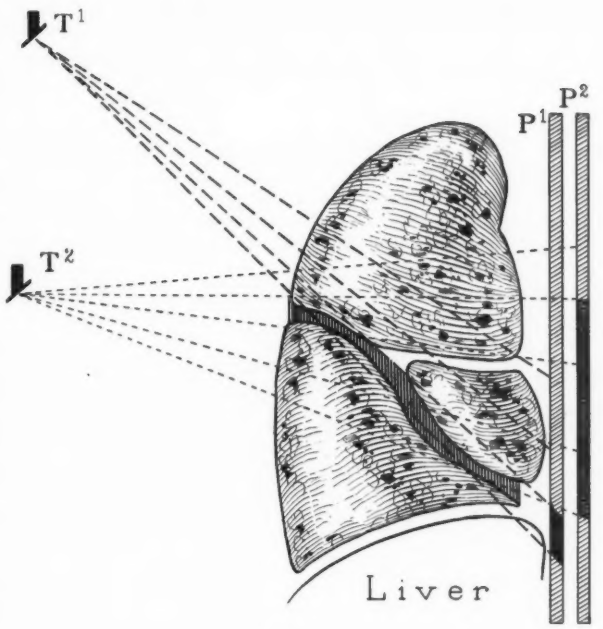


Fig. 3

(Modified after Chaoul and Stierlin) Diagrammatic drawing illustrating the correct and the incorrect methods of obtaining a roentgenogram in cases of suspected pleural effusion between the upper and lower and the middle and lower lobes of the lung. The postero-anterior roentgenograms obtained in the usual manner with the tube in the position of T2 results in a broad, indistinct shadow on the roentgen plate (P2). If, however, the position of the tube is changed as in T1 so that the roentgen rays will parallel the surface of the fluid and penetrate throughout the entire distance of the fluid, a narrow but distinct shadow will be shown on the roentgenogram (P1).

The surgical treatment of pulmonary tuberculosis would be very unsatisfactory were it not possible preoperatively to study the case roentgenographically and follow the patient postoperatively by means of the x-ray. The surgical treatment of pulmonary tuberculosis consists largely of collapse and immobilization and is usually accomplished by the production of an artificial pneumothorax, paralysis of one of the diaphragmatic leaves, or some type of plastic operation on the thoracic cage. Of these various procedures, artificial pneumothorax is probably the most widely employed, because it produces a maximum amount of collapse with a moderate degree of immobilization. It has the advantage that it can be interrupted at any time and is, therefore, not a destructive procedure. Artificial pneumothorax is, however, limited to those cases in which a free pleural cavity is present and is contraindicated or not possible in those cases in which dense adhesions, which prohibit the collapse of the lungs, are present between the visceral and parietal layers of pleura. Frequently, however, if fine adhesions are present, they may be divided through a thoracoscope by means of the cautery and collapse of the lung obtained.[22 23 24 25] Frequent x-ray examinations are necessary to follow satisfactorily cases treated with artificial pneumothorax in order to determine whether collapse

of the lung is secured, as well as the condition of the contralateral lung. Good results can usually be expected in those cases in which, due to the absence of adhesions, a satisfactory collapse can be obtained.

Phrenic nerve operations are indicated as therapeutic procedures in tuberculosis and a test operation for more destructive procedures, such as thoracoplasty. The greatest results from phrenic nerve operations are obtained in those cases in which preoperatively a normal mobility of the diaphragm is present. This is best determined by fluoroscopic examination. Relatively few results can be expected in those cases in which the diaphragm is fixed by a fibrotic process at the base of the lung. It is my opinion that a phrenic nerve operation in such a case is not indicated, as it is illogical to assume that much can be accomplished by paralyzing a fixed diaphragm. In order to obtain a diaphragmatic paralysis it is important that all of the fibers entering the phrenic nerve over which impulses responsible for the movement of the diaphragm be interrupted, because accessory fibers usually enter the phrenic nerve in the thorax. Felix[26] suggested evulsion instead of division of the nerve. Yates[27] suggests performing the operation on the fluoroscopic table in order that it may be determined fluoroscopically before the operation is completed whether all of the fibers have been interrupted or not. A complete interruption of impulses to a diaphragmatic leaf can be determined only by finding fluoroscopically paradoxical movement of the diaphragm. Elevation of the diaphragm is suggestive of diaphragmatic paralysis, but is not absolute.

The more destructive types of collapse therapy in tuberculosis, such as thoracoplasty, are more or less limited to those cases in which a unilateral process is existent. It is also a well known fact that collapse therapy is especially indicated in those cases in which there is a tendency toward fibrosis, the prognosis being very much better in this group of cases than in the exudative type. Fibrosis can be demonstrated more readily by means of the roentgen plate than by any other means. Sauerbruch[28] has stressed the selection of those cases for thoracoplasty in which the tuberculous process is not progressive, but has been stabilized. This is best determined by a comparison of serial roentgenograms. Thoracoplasty is seldom, if ever, indicated on the basis of a single series of plates, but only after careful study of the case by means of repeated roentgenograms. Roentgenography is also of importance in following patients upon whom a thoracoplasty has been performed. The presence of thick-walled cavities which result in the persistence of a tuberculous infection will almost invariably vitiate an otherwise good result. The persistence of these cavities can be determined only roentgenologically, and when they are present, every attempt should be made to cause their obliteration by some additional procedure. Alexander[29] has emphasized the importance of using special surgical procedures for the collapse of such large, upper lobe, tuberculous cavities.

Probably in no one intrathoracic lesion is roentgenography of more importance than in new growths. Unfortunately, neoplasms of the lung, pleura, and mediastinum are apt to produce few or no symptoms until relatively far advanced. They are frequently discovered during a roentgen examination for other conditions. In all patients at any age, but especially in advanced age, with persistent respiratory symptoms, especially cough, a roentgen ray examination is imperative. The finding of a shadow in the region of the hilum, especially with atelectasis of the corresponding lobe, is indicative of bronchial carcinoma and should be considered as such until proven otherwise by bronchoscopy and biopsy. Hilar carcinomas are especially apt to extend through the bronchial lymphatics to the periphery with the production of shadows extending from the hilum to the periphery. They are more apt to involve the upper lobe than the middle and lower lobes. In contrast to a tuberculous process, the apex is not involved, but remains free with the result that the shadow is concave laterally and above (Chaoul and Stierlin[2]). It must not be forgotten that carcinomas of the lung and bronchus may frequently have a central necrosis with the production of an abscess so that the clinical and frequently the roentgenological manifestations are those of a pulmonary abscess and not of carcinoma. Tumors of the pleura are relatively infrequent. Endotheliomas occur most frequently. By virtue of their presence in the pleura they usually incite a pleural reaction with the production of pleural exudate. This exudate is generally hemorrhagic. Roentgenologically the tumor can be seen to encroach upon the lung field in the periphery. A diagnostic artificial pneumothorax is an aid in their visualization. Tumors of the mediastinum are usually diagnosed only by x-ray, although they can be suspected from the physical findings. Of the benign tumors, the most frequently encountered and the most important, therefore, are the dermoid cysts. They vary considerably in size,

are usually situated in the anterior mediastinum, but may extend laterally and encroach upon either pleural cavity. Roentgenologically the diagnosis is quite easy, because these are nonpulsating tumors with well defined edges and they are situated in the superior mediastinum. Ganglion neuromas are benign tumors situated in the posterior mediastinum behind the heart and they are usually detected only by x-ray examination. The malignant tumors of the anterior mediastinum are Hodgkin's disease, lymphosarcomas, and diseases of the thymus. They are diagnosed largely by their location in the superior mediastinum, by the fact that they give rise to symptoms of pressure, and by their marked radiosensitivity. The differentiation of mediastinal tumors from aortic aneurysm is important. This can best be done by fluoroscopy, as in the latter an expansile pulsation is present, whereas in the former, if a pulsation is present, it is transmitted and not expansile.

The radiologist is of value to the thoracic surgeon in the diagnosis of pericardial effusion and adherent pericarditis. Whereas pericardial effusion can usually be suspected in cases of empyema, pericardial injury, or septicemia, it is frequently overlooked unless the condition is thought of and especially looked for. The clinical findings are not characteristic; in fact, they are rather vague. Roentgenologically, however, the diagnosis is relatively easy and is made on the finding of an abnormally shaped heart which changes in form with change in position. The water-bottle-shaped pericardium, especially if there is an absence of pulsation, is pathognomonic of a large pericardial effusion. According to Kornblum, Bellet and Ostrum,[30] the diagnosis of pericardial effusion is difficult in those cases with relatively little fluid in the pericardial sac. There is, as a rule, a decrease in pulsation, although the pulsation may not be lost completely. Kornblum *et al*[30] recommend serial roentgenograms, as an increase in cardiac shadow over a short period of time is indicative of a rapid accumulation of fluid. Of diagnostic importance from the roentgenological standpoint is the obliteration of the normal cardiac outline, especially the auricular-ventricular indentation. The diagnosis is confirmed by aspiration. The importance of early diagnosis of pericardial effusion is evident because of the danger of heart tamponnade with the resulting cardiac failure. Unless this tamponnade is relieved, irreparable damage and even death may result. The diagnosis of adherent pericarditis is even more difficult, frequently because there are no symptoms which are characteristic of the condition. It is important to distinguish those cases of pericarditis with mediastinal and diaphragmatic adhesions in which the cardiac embarrassment is the result of fixation of the heart and constant pull against unyielding structures, from those cases in which the heart is encased virtually in a coat of mail, the so-called *concretio cordis*, in which, as a result of a dense, fibrous sheath around the heart, diastolic relaxation is hampered. In the chronic mediastino-pericarditis the heart is fixed. There is no change in the position of the heart with the change in the position of the patient. As suggested by Ellsworth Smith,[31] in those cases in which adhesions exist between the pericardium and the diaphragm a systolic tug of the diaphragm is visible fluoroscopically. These roentgenologic findings, together with other positive findings, such as fixation of the electrical axis and systolic contraction of the chest wall, are diagnostic of chronic mediastino-pericarditis. In contrast to this type of pericarditis, in *concretio cordis*, the heart is apt to be small, much smaller than normal and characteristically there is an absent or greatly diminished cardiac pulsation, which is due to the fact that because of the thick, fibrous casement surrounding the heart, relaxation in diastole is hampered. It is important for the thoracic surgeon to determine preoperatively the type of chronic pericarditis, as the operative procedure employed differs in the two types. The chronic mediastino-pericarditis is best treated by mobilization of the rigid chest wall overlying and adherent to the heart by resection of the corresponding ribs. In cases of *concretio cordis* simple mobilization of the thoracic cage is not sufficient, excision of the thickened fibrosed and contracted pericardium being necessary to relieve the cardiac embarrassment.

SUMMARY

(1) Without roentgenology present day thoracic surgery would be impossible.

(2) Accurate localization of intrathoracic lesions is imperative before any surgical approach can be planned.

(3) Six-foot roentgenograms give a true conception of size and position of intrathoracic lesions with less distortion than films exposed at short range.

(4) Stereoroentgenograms and lateral roentgenograms are complementary to antero-posterior films.

(5) Roentgenography is of indispensable aid in diagnosing and localizing thoracic lesions and

following the course of these lesions both preoperatively and postoperatively.

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DISCUSSION (*Abstract*)

*Dr. E. C. Drash, University, Va.*—The value of roentgenological studies of the chest depends upon the usefulness of the plates for diagnosis and localization of intrathoracic lesions. The time at which the plates are taken in relation to the onset of the illness is a factor of great importance. In this respect the roentgenologist may act as an intermediary between the medical or other services and the thoracic surgeon by suggesting the entry of the latter into the case as a consultant.

The routine stereoscopic and lateral plates usually suffice. Plates taken in other directions, with or without diagnostic pneumothorax, may be utilized to great advantage in many instances. Stereoscopic plates are not of much value in marked inflammatory processes in the lung because the haze of pulmonary infiltration obscures detail and prevents accurate localization.

The necessity for repeated (serial) x-rays in pulmonary tuberculosis is beyond dispute. There is also a need, but one less well recognized, for serial plates in inflammatory non-tuberculous diseases of the chest. Early lesions can be followed accurately, and complicating developments discovered promptly. This is particularly true in purulent pericarditis when changes in the size and contour of the heart shadow can be recognized in the x-ray long before the physical signs become well developed.

Accurate localization of intrathoracic lesions is nowhere better illustrated than in the diagnosis of encapsulated interlobar empyema, especially in cases that show practically no physical signs. Dr. Ochsner has described in detail the use of lipiodol in showing the exact extent of bronchiectasis. This condition may thus be recognized long before the "text-book picture" of far advanced bronchiectasis occurs. In carcinoma of the lung, bronchioscopic examinations and biopsy are a necessary part of a careful study. However, it may not be possible to obtain a biopsy if the tumor is located far out towards the periphery in a fourth division bronchus. Good stereoscopic chest plates may be absolutely diagnostic of such lesions.

The value of the radiologist is well shown in the study of mediastinal lesions. Here the use of the fluoroscope adds materially to the information concerning the lesions. In early mediastinitis the plate may show changes which indicate the advisability of operation, and possibly make the difference between life and death.

*Dr. Ochsner* (*closing*).—As regards the particular type of roentgen photograph obtained, it is important that the roentgenologist and surgeon employ that with which they are most familiar. There is probably nothing more confusing than for one to attempt to interpret an oblique roentgenogram if he is not familiar with this type of film. On the other hand, it is important that the radiologist, the internist, and the surgeon interested in thoracic disease become familiar with the various types of roentgen photographs, as these at times offer distinct advantages over the routine antero-posterior and lateral views.

In closing may I again emphasize that were it not for the radiological visualization of intrathoracic lesions the thoracic surgeon would be able to accomplish very little.

# THE MODIFIED GOEBELL-STOECKEL OPERATION FOR URINARY INCONTINENCE*

*By* RICHARD W. TELINDE, M.D.,
Baltimore, Maryland

Few conditions are as distressing to the patient as urinary incontinence, not only because of the physical annoyance but also because of the mental distress accompanying it. The greatest number of incontinence cases in women, both partial and complete, are due to childbirth injuries. Fortunately the operative procedure necessary to effect a cure in these cases is less extensive than in other types of incontinence, such as those dependent on congenital defects of bladder and urethral formation or neurological conditions. In 1913 Dr. Howard A. Kelly[1] described an operation for incontinence due to childbirth injuries which in most cases gives a satisfactory result. It consists of denuding the base of the bladder and vesical end of the urethra and suturing the torn or relaxed tissues in this area. In the case of an accompanying cystocele, it should be repaired at the same time. Prior to this, other methods were used with occasional benefit. Among these may be mentioned the paraffin injections of Gersuny[2] in the region of the internal sphincter and the human fat injection of A. Mayer.[3] Faradic stimulation of the sphincter muscle was used without much success. These procedures are now only of historical interest. In cases where the Kelly operation has not sufficed, strips of the levator muscles as recommended by Franz[4] have been utilized with success. Muscles of the thigh have also been used with partial success, but the fact that the skin of the thigh is often excoriated increases the possibility of infection, thus reducing the chances of success.

The purpose of this paper is to call to your attention and recommend to your use an operative procedure to be utilized in cases of urinary incontinence in which the usual sphincter muscles do not function satisfactorily by virtue of the fact that they lack proper innervation. A report of a case in which the operation was done with a very satisfactory result follows.

*Case 15585,* J. H. H., a white girl of 18, had been under observation and treatment for three years in the orthopedic department of the Johns Hopkins Clinic because of pes equino cavus and paralysis of several muscles of both legs. X-ray showed a spina bifida. There had been complete rectal and bladder incontinence since birth, obviously due to faulty innervation of the sphincter muscle resulting from this developmental defect in the lower spine. In October, 1931, Dr. Harvey Stone[5] performed his operation for rectal incontinence, which consists of utilizing a portion of the gluteus maximus muscles to make traction on strips of prepared fascia encircling the anus. A perfect functional result was obtained. Dr. Stone then asked me to give the patient urinary control. She gave a history of being able to hold her urine from two to four hours, at the end of which time she would note a desire to void and immediately the bladder would involuntarily empty itself. She had had nocturnal enuresis two to three times per night all her life. There was no constant dribbling, but strenuous exercise caused her to spurt urine. She could empty her bladder by making pressure in the suprapubic region. Cystoscopic examination showed that the vesical orifice closed normally on withdrawal of the cystoscope. About a year previously an attempt had been made to give her control by plication of the muscles about her urethra. As might be expected, this did not alter the incontinence.

On September 2, 1932, a modified Goebell-Stoeckel operation was done. A small male retention catheter was left in the bladder. On the sixth day the catheter came out spontaneously and was allowed to remain out. At first there was some urinary leakage, but this improved rapidly so that after nine days the patient felt that she had perfect control. On October 8, 1932, she returned for observation, stating that she could control her urine satisfactorily. A year after the operation she reported control both day and night.

## OPERATION

The operation to which I wish to call your attention is designated as the Goebell-Stoeckel operation, by which name it is generally known in the country of its origin, although, like many operations, the procedure here described is the result of the combined efforts of several men. In 1910, Rudolf Goebell,[6] of Kiel, described an operation for urinary incontinence which he performed with success on a 4-year-old girl with epispadias and also on a 2-year-old child with incontinence following a meningocele operation. His procedure was as follows. A Pfannenstiel incision was made exposing the pyramidalis muscles which were dissected free except at their point of origin on the symphysis. A complete dissection was carried out about the base of the bladder and the ends of the pyramidalis muscles sutured together beneath the junction of bladder and urethra. In case the muscles were sufficiently long, they were crossed. Frangenheim[7] modified the technic by leaving the muscles attached to strips of fascia and encircling the sphincter region with fascia and muscle. The obvious advantage of this procedure lies in the fact that the fascia can be made of any

*Read in Section on Gynecology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

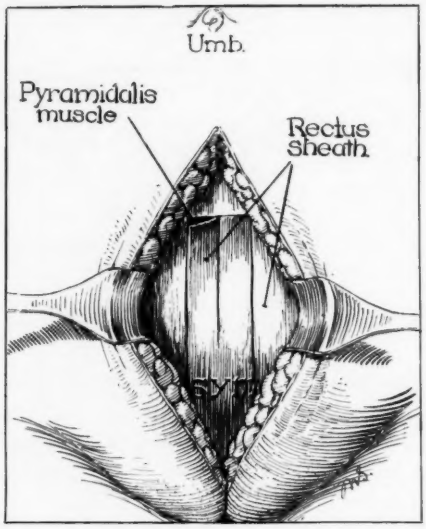


**Fig. 1**
The strip of fascia with subadjacent pyramidalis muscles is cut and divided longitudinally.

desired length, a great convenience in cases where there is a thick symphysis. Also, by leaving the muscles attached to the overlying fascia, the chances of interference with blood and nerve supply of the muscles are diminished. Stoeckel[8] extended the application of the operation to cases of childbirth incontinence and combined it with a vaginal operation in which the muscular tissue at the urethro-trigonal junction was plicated. Inasmuch as these cases due to childbirth injury are generally curable by the vaginal procedure alone, it would seem unwise to adapt this more extensive procedure as a routine for such cases, reserving it for those in which the simple plication has failed. In 1932, Norman Miller[9] reported an important modification of this operation, in which the muscle and fascia were brought down anteriorly to the symphysis. The obvious advantage of this lies in the fact that often difficult dissection about the base of the bladder is done away with. Experience with other types of bladder operations has shown us that this dissection often carries one very deep retropubically, which region is quite vascular and control of bleeding may be very difficult. The operation in the case reported was done according to Miller's modification.

The patient is placed on the table in a partial lithotomy position, with legs spread and elevated sufficiently to allow room for work in the vagina, but not so high as to interfere with work in the abdominal region. By placing the patient in this position the entire operative field can be draped at once. A very low midline incision is made for about two-thirds of the way to the umbilicus and the fat dissected free from the rectus fascia. A strip of fascia, about 2 cm. wide, is freed in the midline and separated from the subadjacent rectus muscle, but the pyramidalis is left attached to the under surface of the fascia (*Fig. 1*). The strip is then divided longitudinally, thus separating the two pyramidalis muscles. In case of under-development of either pyramidalis muscle a portion of the rectus may be substituted. The fascia and muscles are then wrapped in gauze wet with warm saline solution and the incision in the fascia is closed as far down as possible. Subcutaneous fat and skin are sutured and covered with a dry dressing before beginning the vaginal part of the operation. The lower end of the

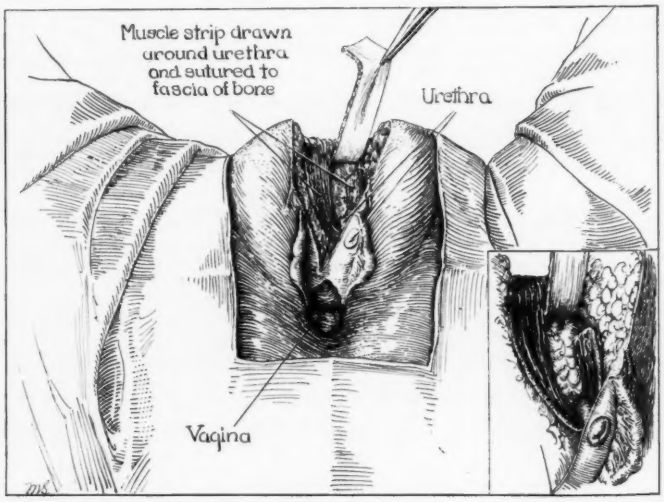


**Fig. 2**
The muscle fascia strips are brought around the urethra and sutured in this position.

incision is then carried down on one side of the clitoris to a point just below the urinary meatus. The muscle-fascia flaps are then turned down over the symphysis. A curved clamp is made to tunnel around the urethra and the end of one muscle-fascia flap caught, after which the clamp is withdrawn. The other flap is drawn around the urethra from the opposite direction so that the urethra is surrounded by a U-shaped band, the ends of the two flaps overlapping (*Fig. 2*). The ends are then sutured together at three or four points with linen or silk thread. The submucosal tissues and mucosa are then sutured and a small catheter is left in the bladder for several days.

## DISCUSSION

In considering this case it would seem that the patient's incontinence was due to a failure in innervation of the voluntary sphincter muscles. According to Kalisher, who has done very careful studies on the bladder and urethral musculature, three muscles are concerned in the sphincter action. The outer third of the urethra is surrounded by voluntary muscle fibers of the bulbo-cavernosis (constrictor vaginae). The middle third and outer part of the inner third of the urethra is surrounded by the voluntary sphincter urogenitalis. The greater part of the inner third of the urethra is surrounded by the involuntary fibers of the sphincter trigonalis. This muscle extends from the lower ends of the ureters across the trigone and around the urethra in a U manner (*Fig. 3*). This muscle, remaining in tonic contraction, draws the anterior and posterior urethral walls in apposition. In the case reported it would seem that the involuntary sphincter trigonalis functioned satisfactorily until the intravesical pressure reached a certain point when the muscular tone would give way and the bladder empty itself. The voluntary sphincters being

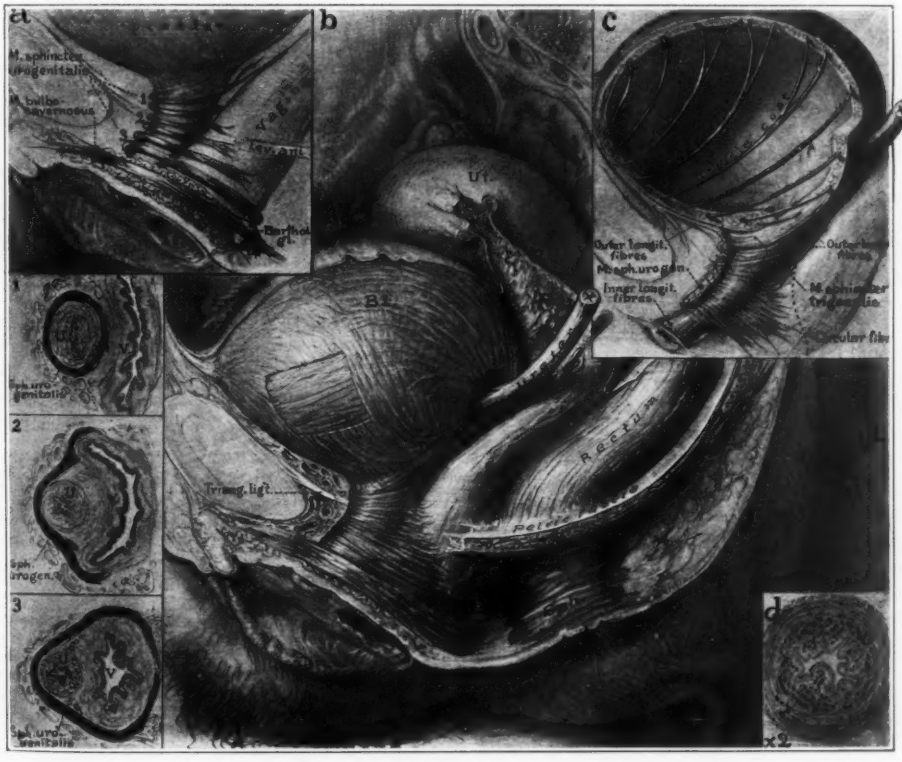


**Fig. 3**

Normal sphincter musculature of female bladder and urethra. The bulbo-cavernosus and sphincter urogenitalis are under the control of the will. The sphincter trigonalis is composed of involuntary muscle.

without innervation, the patient was unable to contract her urethral sphincters to keep from involuntary voiding. The problem, therefore, was to supply her with voluntary sphincters to aid the trigonal sphincter. Only muscles receiving their innervation from nerves arising from the cord at a point above the developmental defect would be eligible for the purpose. Thus the pyramidalis muscles seemed well suited. The action of the sphincter formed by this operation is obviously a pulling of the posterior wall of the urethra against the anterior. The patient was questioned as to the manner in which she started urination. She replied that she simply had the desire and without any special effort the act began. She could interrupt the flow of urine at will.

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## DISCUSSION (*Abstract*)

*Dr. Charles R. Robins, Richmond, Va.*—Dr. TeLinde's case is somewhat unusual in that the incontinence was not complete and the bladder was partially under control, the control being best at the point of the posterior urethra and anterior trigone. In this case the modified operation of Dr. Norman Miller was certainly ideal, but there is a question as to its utility in cases where the posterior urethra and trigone are the seat of loss of function.

The essayist has described the action of the cut-off mechanism of the bladder which I consider the true one. There can be no question that the Goebell-Stoeckel operation has a distinct field, but I agree with Dr. TeLinde that it is necessary only in a comparatively limited number of cases. There do occur cases of birth trauma, however, in which the plastic work on the neck of the bladder is inadequate.

The Goebell-Stoeckel operation is not, as a rule, a primary operation. Where there has been trauma eventuating in incontinence, the removal of scar tissue and repair of the damaged structures is indispensable, and then this operation is performed as an adjuvant if necessary.

There appears to be no question that the Goebell-Stoeckel operation accomplished its purposes, but there does seem to be a question as to how Stoeckel himself contends that the use of muscle tissue with the idea that the muscles will contract as a sphincter is not well founded. In the first place, as the essayist says, the bladder is not closed by a true sphincter, but by a mechanism that draws the posterior wall of the urethra and trigone upward against the anterior wall. Experiments have shown that the muscles, after being transplanted, do not respond to faradic current. The real action of this muscle-fascia sling is to pull the urethra up, and it seems to be under the control of the abdominal muscles.

As to the tissue employed and its action, Stoeckel says definitely: "I have come to the conclusion that it appears to be immaterial as to what the ring that surrounds the urethra consisted of, provided it is lasting and that the posterior wall of the urethra is held high and can be elevated by the abdominal muscles."

*Dr. Guy L. Hunner, Baltimore, Md.*—My case which Dr. TeLinde has mentioned and from which the drawings which he presented were made, was that of an unmarried woman, 23 years of age, who had never had control of the bladder function. Investigation revealed apparent fission of the clitoris and prepuce, the lateral halves of these organs apparently forming, on either side, an anterior extension of the labium minor. Apparently the urethral tube was absent. The entrance to the bladder was represented by a large transverse elliptical slit, rather more than 1 cm. wide, and this stood open when the patient was in the lithotomy position. This orifice was less than one centimeter back of the base of the hymen. With the patient in the knee-chest position this orifice remained closed until its posterior edge was slightly lifted, when it opened widely, allowing air to fill the bladder, and showing a channel about 1 cm. long, probably representing the funnel-shaped bladder neck rather than the urethra.

The bladder appeared small, but the mucosa was everywhere normal except in the mid-vertex where "there is an irregular area, measuring about 3 cm. antero-posteriorly and 2 cm. laterally, made up of patches of deeply congested red areas situated on a paler background. This entire area apparently represents an elusive ulcer lesion." The patient had considerably enlarged tonsils, but no evident pharyngitis. There was marked dental caries. The elusive ulcer area was thoroughly fulgurated after the patient was anesthetized for operation.

In a preliminary study of the comparative virtues of the Stoeckel and Miller operations it seemed that the latter operation promised not only to be far easier in execution, but offered for this particular case a more certain functional end-result. There being such a short bladder neck or urethral channel, the fascial strips placed by the Stoeckel method would have for counter-pressure only the relatively loose and mobile tissues back of the symphysis; whereas the strips placed about the bladder neck by the Miller method would have both an upward and a forward pull, thus hugging the short urethra against the rigid symphysis.

As Dr. TeLinde has suggested, the Miller operation should be done with the patient permanently placed in the lithotomy position. I first had my patient in the dorsal position for the dissecting out of the rectus fascial strips. These were protected by salt solution gauze sponges while we closed most of the abdominal wound. Then the legs were elevated to the lithotomy position to finish the perineal portion of the operation. There was nothing difficult about any part of the operation, but the patient was rather stout and the fatty pad of the mons veneris was unusually thick; and, being a little skeptical about our technic incident to the shift of the patient's position on the table, I think I jeopardized the success of the operation by leaving a drain in the mid-portion of the deep fat of the mons.

The patient had perfect sphincter control for six days, voiding as much as 360 c. c. of urine on one occasion. Meanwhile the deep fat of the wound became infected and there developed an extensive slough, resulting in complete failure of the operation.

Our meager experience does not warrant the drawing of final conclusions concerning the merits of various operative procedures. The Stoeckel operation, while more difficult of execution, has the great advantage of keeping away from the perineum, which in cases of incontinence is likely to present an inflammatory condition of the skin and dangers of wound infection. Deming's method of using strips from the edge of the gracilis muscle offers an opportunity to avoid the deep fatty pad of the mons, but, like the Miller method, it involves the dangers of working in an infected area.

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## FRACTURES OF THE FACIAL BONES WITH SPECIAL REFERENCE TO INVOLVEMENT OF THE PARANASAL SINUSES AND ORBITS*

*By* WILLIAM D. GILL, M.D., F.A.C.S.,
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In the present day machine age there has been a great increase in the number of injuries involving the head and face, and especially is this true of fractures of the facial bones. Until recently there has been very little in medical literature concerning the treatment of fractures of this type, but within recent years there has been an increased interest in the subject.

Most fractures involving the facial bones, except those of the nasal bones, extend into one or more of the paranasal sinuses, and fractures involving the walls of the orbit are often complicated by involvement of the adjacent paranasal sinuses.

The treatment of fractures of the nasal bones is too well standardized to necessitate a discussion in this article and will be omitted.

Because of the importance of the frontal bone, which is classified as one of the bones of the skull, and because of the part it plays in fractures involving the paranasal sinuses and orbits, it will be included.

Many causes are responsible for fractures of the facial bones, but direct violence heads the list. Automobile, aeroplane and motorcycle accidents, as well as blows with blunt instruments, may be mentioned as usual causes. The injuries are often incurred in falls. Gunshot wounds, except in time of war, are infrequently responsible for such injuries.

The degree of injury is subject to great variation and ranges from slight and relatively unimportant fractures without displacement of fragments to extensive crushing injuries.

Surgical shock is always an accompaniment of the more severe fractures of the facial bones.

Where communication with the nose or sinuses has been established air may easily find its way into the soft parts and emphysema is likely to occur, especially in fractures involving the medial wall of the orbit or the anterior wall of the antrum. Emphysema is less frequently encountered following fractures involving the frontal sinuses, but it does occur.

Displacement of fragments or hemorrhage into the orbit may seriously interfere with motility of the eyeball or be responsible for its actual displacement. Pressure from massive hemorrhage into the orbit has been known to result in atrophy of the optic nerve.

Hemorrhage and emphysema may occur simultaneously in the soft parts.

Fractures involving the maxillary sinuses or antrum of Highmore are quite frequent, because of the fact that the malar bone is, next to the nasal bones, the facial bone most frequently involved in fractures, and because of the fact that this bone forms a large part of the lateral and superior walls of the antrum.

Careless dental surgery is responsible for a small percentage of fractures involving the alveolar process and radiating into the antrum on the same side.

Hemorrhage takes place from the small vessels within the antrum when the mucoperiosteum is lacerated, and the sinus quickly fills with blood. The hemorrhage may be slight and readily absorbed, or it may be alarming in degree and necessitate operative interference for its control.

Recovery of any of the sinuses depends upon the degree of injury, and also upon the presence of infection either at the time of injury or its subsequent development.

Fractures of the frontal sinus are especially serious, because of the likelihood of injury to the brain or meninges. The anterior or posterior walls of the frontal sinus may be involved alone or in combination.

Fractures involving the ethmoidal sinuses are usually caused by some penetrating object, although they may occur if fracture lines radiate from contiguous bones. The essential features

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*Chairman's Address, Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

Fig. 1

Top—left: Suppurative osteitis with sequestration of malar bone and anterior antral wall following fracture involving malar bone and antrum on left side.

Top—right: Suppurative osteitis with sequestration of left malar bone following fracture of this bone.

Bottom—left: Transverse fracture through both orbits with resulting separation of fragments (malunion) and malocclusion of the teeth due to faulty fixation of fragments.

Bottom—right: Transverse fracture through both orbits. Fragments retained in proper apposition by wiring through zygomatic process on both sides.

are epistaxis and emphysema of the orbital tissues. Meningitis may follow fractures in this region, and is especially likely to occur if the cribriform plate of the ethmoid bone is involved. Cerebral rhinorrhea, which is almost invariably fatal, may be a sequel to such fractures.

Fractures involving the sphenoidal sinuses have no characteristic diagnostic symptoms, and are similar to fractures involving the ethmoidal sinuses. The same dangers pertain to fractures in this region as in the ethmoidal region. However, fractures in this locality, because of the proximity to vital intracranial structures, are more likely to prove fatal than are the more anteriorly placed injuries.

Fractures involving the orbits are divided anatomically into those of the margins, the walls and the apex. These divisions may be involved separately or in combination. The possibility of injury to the eye or its appendages makes fractures of this class especially serious. In such injuries the damage to the eyeball ranges from slight lacerations or contusions to rupture of the globe, with extrusion of its contents. Laceration of the lacrimal sac or lacrimonasal passages from spicules of bone or obstruction from pressure of fragments may occur. If infection is present in the lacrimonasal passages it may extend into the surrounding soft tissues.

Fractures of the facial bones unite quickly because of their abundant blood supply. For this reason early reduction is necessary.

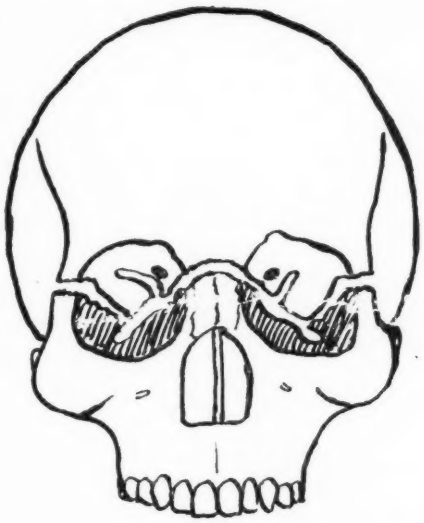


Fig. 2

The bones of the face and those of the cranium meet in the orbit. This junction point constitutes a potential weak area in the craniofacial architecture. The accompanying illustration is a diagrammatic representation of this juncture.

Osteomyelitis is an occasional sequel of fractures involving the facial bones and is usually traceable to pre-existing infection in the involved sinuses.

Fractures of the facial bones should always be suspected where contusion of any degree has occurred involving the soft tissues of the face.

The x-ray is not as valuable in diagnosing such fractures as it is in other parts of the body. Inspection and palpation of the underlying bony parts and comparison with the opposite side will often reveal a fracture with displacement of the fragments, where the x-ray has failed to reveal it. Recently certain radiographic signs have been described by Shea,[1] which are of value in diagnosing fractures of the facial bones, especially the malar bone. These signs are based on alteration in the relationship of two lines visible at the lateral margin of the orbit in an anteroposterior film taken in the position usually employed for maxillary sinus x-rays. The same writer considers a change in the transverse diameter of the orbit of definite diagnostic value in such injuries.

It is essential that fractures involving the facial bones be reduced as quickly as possible. Oftentimes swelling of the overlying tissues or infiltration with blood makes it necessary to postpone reposition of the fragments for several days, because of the fact that palpation cannot be accurately employed through swollen tissues to determine when reduction has been effected. A variety of methods may be used to reduce the displaced fragments: one is that of Matas,[2] in which the depressed bone is elevated by means of a silver wire suture passed around it. Codman[3] uses a bullet forceps to pull the depressed fragment into position. Wurdemann[4] uses a strong resection hook to accomplish the same result. Lothrop[5] and Naftzger[6] open the antrum in a manner similar to that employed in radical sinus surgery; while Shea[1] uses a Ritter sound, introduced through a naso-antral window. This latter method is especially valuable, because it permits washing clots from the antrum through the opening made for the sound. Evans[7] advocates the method of Shea, because of the fact that the naso-antral window provides drainage to the antrum. Goldthwaite[8] elevates the depressed zygomatic arch by inserting a flat periosteal elevator through an incision above the last molar tooth. Roberts[9] recommends inserting a screw into the bone through a stab incision in the soft parts in order to elevate it. The

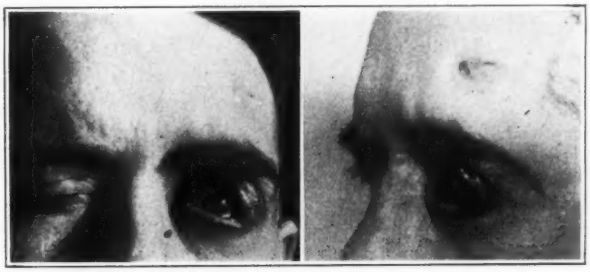


Fig. 3

Suppurative osteitis of frontal bone, following fracture of both anterior and posterior walls. Note ectropion of upper eyelid due to retraction into the cavity of the frontal sinus.

writer[10 11] uses a special grasping forceps to seize the bone and move it into its normal position, a method which leaves no visible scarring afterwards and which may ordinarily be accomplished under local anesthesia. In the absence of this specially designed forceps a heavy towel clip may be used for the same purpose, though it is less satisfactory.

Ordinarily no retaining appliances are required, as the serrated bone edges interlock and serve for fixation. Kazanjiian,[12] Blair[13] and Bodine[16] emphasize in their writings that badly

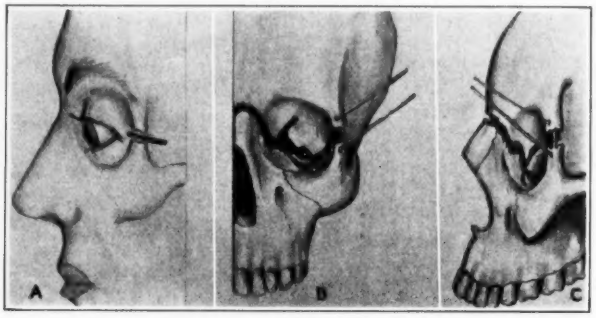



Fig. 4

Method of wiring facial bones to the skull in extensive fractures passing through both orbits.

A. Skin incision: Care must be exercised to avoid cutting fibers of the facial nerve, orbicularis oculi muscle, or the external palbebral ligament.

B. Silver wire passed through drill holes in the frontal process of the zygoma and the zygomatic process of the frontal. The suture is passed subperiosteally when possible. A blunt instrument is inserted between the eyeball and the eyelids at the canthus to prevent injury to the eyeball from the drill, or in passing the wire suture.

C. Same as B, viewed from the side. There is less danger of opening the cranial cavity in drilling the frontal process, if it is done in this manner.

Fig. 5

Method used to protect eyeball from injury in drilling the zygomatic process of the frontal bone in preparation for wiring of fracture in this region.

comminuted fractures may require retaining appliances, such as interdental splints and plaster head caps. In fractures passing completely through both orbits and separating the bones of the face from those of the skull, the writer[11] has devised a method of wiring the fractures by drilling the zygomatic process of the frontal bone and the fragment beneath it and pulling the two in apposition by means of a heavy silver wire suture, which is allowed to remain *in situ*. The advantage of this method is the minimal scarring which is produced and the fact that there is considerably less discomfort to the patient than would obtain if a plaster head cap were employed in conjunction with an interdental splint.

The writer has occasionally had recourse to a method of reducing angulated fractures of the zygomatic arch where the bony parts were bowed outward, which consists of tapping a piece of wood padded on one extremity and held in firm contact with the angulated bony structure. Occasionally it has been necessary to supplement this force by traction applied anteriorly.

In the treatment of fractures involving only the anterior wall of the frontal sinus, it is best to remove loose fragments of bone, close the overlying skin and provide for endonasal drainage. Particular care must be exercised to determine whether the posterior wall is injured. When the inner wall of the frontal sinus is fractured, it is imperative that external drainage be provided to prevent accumulation of pus under pressure. Infection may follow fracture lines and involve neighboring structures. If the posterior wall is fractured, then external drainage must be provided and great care exercised to see that the cavity is not infected during the convalescent stage, as pathogenic bacteria easily gain access to the sinus through the nasofrontal duct. Parrish[15] has pointed out the advisability of obliterating the frontal sinus by collapsing its anterior wall in order to minimize this danger. It should be borne in mind that the disfigurement following this procedure will vary with the size of the sinus.

The mucoperiosteum of the sinus should not be allowed to invaginate into the fracture line, and dural tears, if present, must be repaired by fascial transplants or otherwise. Such procedures may be possible only by enlarging the defect in the posterior sinus wall.

In fractures of the ethmoidal or sphenoidal sinuses the treatment resolves itself into keeping the nose free from infection, preventing adhesions, and avoiding emphysema of the surrounding soft parts by abstaining from forcible blowing of the nose.

Prolonged suppuration following injury to any of the sinuses may necessitate operative exploration of the sinus or removal of an offending

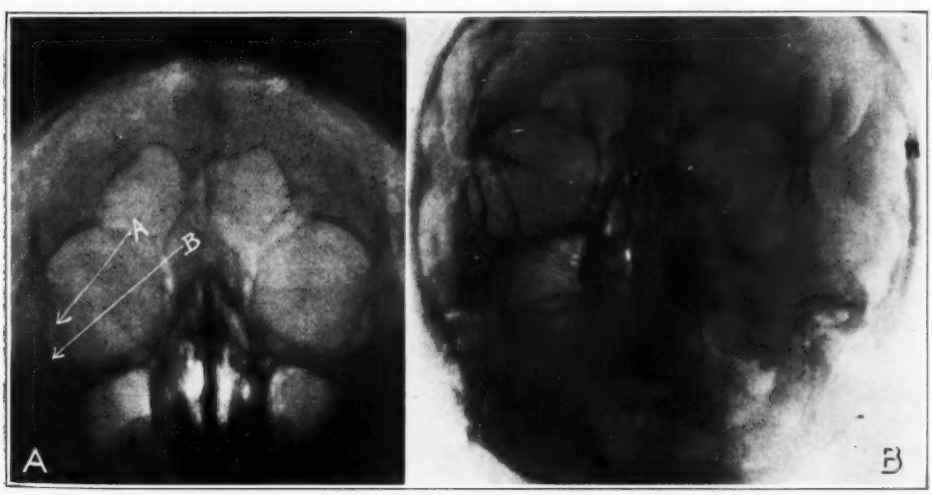
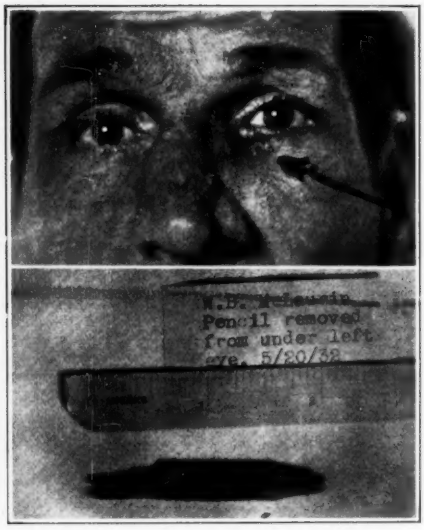



Fig. 6

A. Roentgenogram showing normal relationship of lines (A) and (B), described by Shea, in fractures of the malar bone. A variation in this relationship occurs in fractures associated with rotation of the malar bone.

B. Roentgenogram showing fracture through both orbits, which has been wired according to the method described in the text. Silver wire has been passed through drill holes in the frontal process of the zygoma and zygomatic process of the frontal bone, and the lower fragment pulled into position by this means.



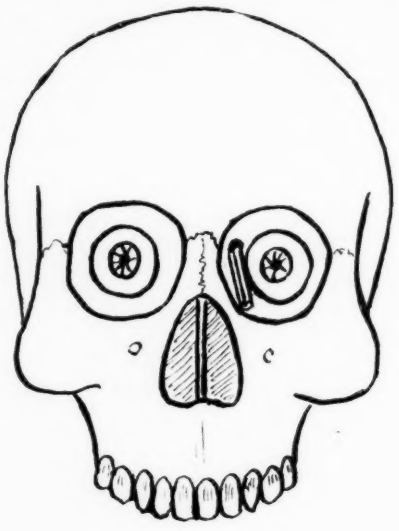



Fig. 7

Fracture involving left ethmoidal sinuses due to penetration of portion of lead pencil.

Top: Note point of entry of pencil marked by fistulous opening at inner aspect of left lower eyelid.

Center: Photograph of portion of lead pencil removed from patient shown above.

Bottom: Diagrammatic illustration showing position of foreign body in left orbit and ethmoidal sinuses of above patient. Foreign body in position eighteen months.

Fig. 8

Illustrating method of reducing fracture of left malar bone associated with marked external angulation of the fragments at the zygomatico-temporal articulation. A padded piece of wood is held in contact with the angulated bony structure at the point shown in the drawing and gently tapped with a mallet, while traction is applied anteriorly by heavy seizing forceps in the direction indicated by the arrow.

Fig. 9

Illustrating the inconsistent infra-orbital suture which may be responsible for a separate small fragment of bone's being detached in fractures involving the antral walls of the orbit.

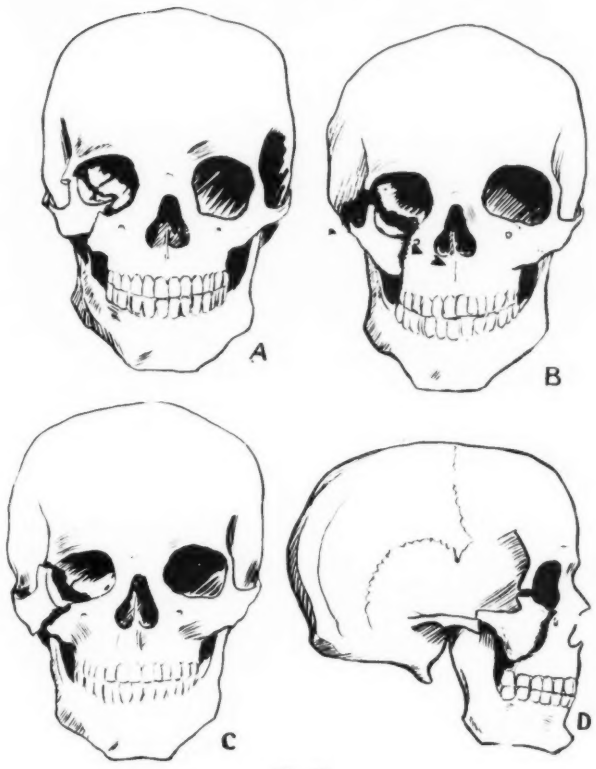



Fig. 10

Diagrammatic representation of several types of fractures involving the malar bone.

A. Inward and upward displacement of malar bone.

B. Downward and inward displacement of malar bone.

C. Outward displacement of malar bone.

D. Lateral representation of skull showing manner in which the temporal process of the malar bone may impinge on the mandible, interfering with its motion.

foreign body, or sequestrum. Persisting infection in any of the sinuses will render the prognosis more serious in fractures.

Fractures involving the alveolar process of the upper jaw are frequently responsible for malocclusion of the teeth, a condition which may contribute considerably to the patient's discomfort.

Fragments slipping backward may impinge upon the coronoid process of the mandible and interfere with the movements of the lower jaw. When this condition exists, it is best immediately to seek the advice of a competent dental surgeon, as much valuable assistance may thus be obtained and the necessary steps may be taken to correct the traumatic occlusion.

Pressure of fragments on nerves, such as the supra-orbital or infra-orbital, gives rise to parasthesia or anesthesia in the distribution of the affected nerve. These disagreeable sequelae may persist for many months after pressure on the nerve has been relieved by reduction of the depressed fragment.

Where there is great edema of the soft parts, it is best to delay reduction of the fragments until the edema has subsided. Reduction may be accomplished satisfactorily two weeks or even longer after in certain cases. Union is, however, quite rapid in facial bone fractures. Fortunately many such injuries are seen before edema comes on and it is at this time that reduction can be accomplished under the most fa-

Fig. 11

Patient who incurred transverse fracture of upper jaws with resultant complete separation of hard palate and all upper teeth. A fistula of the parotid duct on the left side persisted for two months. The left antral floor has been closed by granulation. The right antral floor has a small opening present, approximately one-half inch in diameter.

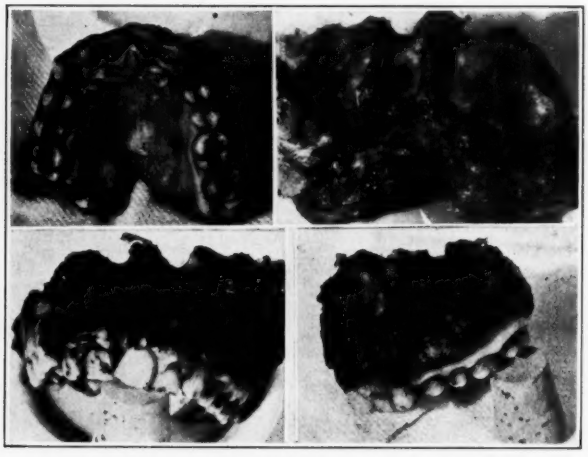


Fig. 12

Entire hard palate bearing the upper teeth which was separated en masse in fracture of upper jaw suffered by patient shown in Fig. 11. The fragment bearing the teeth was mistaken for an artificial denture by several witnesses. The floor of the nasal fossae and the antra may be seen in the specimen.

vorable circumstances, provided shock does not interfere.

Because of the fact that many of these injuries are incurred on highways, tetanus is not to be lightly considered and a prophylactic injection of tetanus antitoxin is advisable in all fractures of the facial bones associated with open wounds. Head injuries may be associated with a particularly fatal type of tetanus, as pointed out by Keen.[16]

If an old fracture is to be corrected it is necessary to reopen the fracture line and move the fragments into their proper position. This is usually a most difficult procedure and at times is impossible to accomplish satisfactorily. In such instances, some form of anchorage such as silver wire suture is usually required. It is oftentimes preferable to correct cosmetic disfigurement by a plastic operation on the soft tissues rather than to attempt reposition of the fragments, as osteoplastic procedures about the face are not especially successful. Operations of the latter type often leave unsightly facial scars and the patient's resultant economic handicap from this source may be greater than that which would result from the uncorrected fracture.

Where fixation of the fragments is necessary, rather than lose valuable time experimenting with various fixation devices, it is urgently recommended that fixation be obtained by wiring the fragments into position or by using a plaster of paris head cap in conjunction with an interdental splint, or by combining both methods.

*Anesthesia.*—Most fractures about the orbit and paranasal sinuses may be reduced under local or general anesthesia. In several instances in patients with depressed fractures of the malar bone, I have infiltrated the fracture line with 1 per cent novocain solution and effected reduction without discomfort to the patient. Massive infiltration with the anesthetic solution should be avoided, as it will interfere somewhat with palpation of the underlying fragments, making it more difficult to determine when reduction is complete. This is not a serious objection and should not act as a deterrent so far as the use of local anesthesia is concerned. I have occasionally used sodium amytal intravenously supplemented by novocain in extensive fractures which required a lengthy operative procedure to effect reduction. Where local anesthesia is not considered practicable the usual gas oxygen anesthesia is entirely satisfactory for the average injury of this nature.

## CONCLUSIONS

(1) Fractures of the facial bones should be suspected in all injuries to the face, and a careful examination should be made to exclude them.

(2) Diagnosis of fractures of the facial bones should be made at the earliest practicable time and reduction accomplished as soon as possible.

(3) Reduction may be accomplished under local or general anesthesia, depending upon the severity of the injury.

(4) In the more severe fractures of the facial bones adequate fixation must be obtained by wiring the fragments, when practicable, or by the use of interdental splints or similar retaining appliances.

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# THE RETICULO-ENDOTHELIAL SYSTEM AND ITS RELATION TO NEOPLASTIC STATES*

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Whether or not the conception of the reticulo-endothelial system as suggested by Aschoff is fully accepted, it must be admitted that within this composite group of tissues are included some of the most variable and least understood cell groups with which histologists and pathologists have to deal. Theories only are available at present to interpret the capacities for differentiation possessed by these cell groups and their motley descendants. A more complete understanding of the various components of the so-called reticulo-endothelial system would serve to clarify many obscure phases of defense mechanisms, of repair processes, of hyperplasias of known and unknown origins and of neoplasms clumsily grouped together in spite of marked structural differences and varied histogenetic origins.

The reticulo-endothelial system is a relatively frequent source of tumor-like hyperplasias and of recognized neoplasms. As is true also in other tissues, no absolute line of distinction can be drawn between some of the hyperplasias and the more fully differentiated neoplasms. However, a consideration of the hyperplasias gives some intimations concerning the histogenesis of the more destructive neoplasms.

(1) *Inflammatory Hyperplasias.*—Regional hyperplasias of inflammatory origin are of fre-

*Read in Section on Pathology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

**Fig. 1**
Inflammatory hyperplasia of reticulo-endothelial cells of lymph sinuses.

quent occurrence and are associated with numerous well-known infections. For example, the pyogenic infections stimulate predominantly a hyperplasia of the supporting reticulum of lymph nodes and the germinal centers of lymph follicles and Malpighian bodies. In typhoid, the hyperplasia involves chiefly the lining cells of the sinuses of lymph nodes and spleen, and the cells lining the sinusoids of the liver. Epithelioid tubercles seem to be formed largely by the sinus reticulum, but the reticulum of the supporting tissues is involved also, as well as derivations of the histiocytes beyond the recognized limits of the reticulo-endothelial system.

Infectious processes not infrequently lead to systemic hyperplasias of the reticulo-endothelial system. Guizetti[1] reported such a hyperplasia involving the spleen, liver, lymph nodes, thymus, lungs and bone marrow of a child which died three weeks after the onset of a generalized streptococcus infection. Histiocytes or fibrocytes outside the usual boundaries of the reticulo-endothelial system participated in this reaction. Chronic sepsis frequently gives rise to varying grades of hyperplasia of the cells associated with the reticular framework of the sinus reticulum of the hematopoietic tissues.

(2) *Hyperplasias of Unknown Etiology.*— Diffuse hyperplasias of entirely unknown etiology have been described under the general terms reticulosis and reticulo-endotheliosis. One feature common to these cases is a systemic proliferation of the reticulum cells of the spleen, bone marrow, lymphoid tissues and the cells of the liver sinusoids. The majority of these reported cases have been examples of proliferation of the sinus-lining reticulum. The proliferating cells are often spindle-shaped and have a tendency to form intercellular fibrils. Using differential staining methods, Goldzieher and Harnick[2] concluded that these fibrils belonged to the reticulum and not to the collagenous fibers of the involved tissue. A gradual transition was observed from the argyrophil reticulum to areas of collagenous fibrosis. The fibrotic areas were thought to represent a later stage in the process, in which the hyperplastic reticulum cells had acquired fibroblastic properties in the sense that they produced collagenous connective tissue. In addition to the spindle cell types, large round cells are present which do not show fibrillary connection with the reticulum, but seem to lie free in the meshes of the reticulum or within the lumina of sinuses. The round cells seem to have lost their ability to produce reticulum fibrils, or, if derived from sinus reticulum, they retain some of the characteristics of lining cells. Occasional multinucleated giant cells are encountered in these lesions. It has been observed that the Kupffer cells of the liver sinusoids and the lining cells of the splenic sinuses participate in these systemic hyperplasias, while the lining cells of the capillaries elsewhere are not involved. Both leukemic and aleukemic forms of the reticulo-endothelioses are recognized.

Of especial interest is the relationship of Hodgkin's disease to the reticuloses or reticulo-endothelioses. Piney[3] regards Hodgkin's disease or lymphogranuloma as essentially a proliferation of reticulo-endothelium and its derivatives, while several investigators have pointed out the difficulties of differentiating between reticulosis and lymphogranuloma. Wihmar,[4] in reporting a case of reticulo-endotheliosis, observed that there was not the same irregular mixture of cell forms seen in lymphogranuloma, and that typical Sternberg giant cells (Dorothy Reed cells) and the suggestive eosinophils of Hodgkin's disease are lacking. The pleomorphism of the lymphogranuloma tissue is good evidence, according to Uehlinger,[5] that lymphogranuloma is an inflammatory process, and that the tendency toward scarring and the frequent splenic involvement

support this assumption. It is significant also that no primary Hodgkin's disease of the bone marrow has been recognized in spite of the frequent secondary involvement by direct extension and by metastasis through the blood stream. In a current review of Hodgkin's disease, Wallhauser[6] accepts the usual statement that there is first a lymphoid hyperplasia of the involved lymphoid tissue and that this is followed by a proliferation of the cells covering the reticulum of the sinuses and of those of the germinal centers. There is a gradual replacement of the lymphoid structure by a polymorphocellular tissue composed of cells derived from the reticulo-endothelium.

Ross[7] has suggested a classification of the progressive hyperplasias of the blood-forming organs under the following headings:

(I) Hyperplasias without disturbances of metabolism

(A) True reticulosis, affecting undifferentiated cells, the follicular reticulum of lymph nodes and Malpighian bodies of the spleen; also the undifferentiated reticulum cells of connective tissues

(B) Sinus reticulosis, leukemic and aleukemic types, affecting the sinus reticulum of lymph sinuses, the sinusoids of the liver and the splenic sinuses

(II) Hyperplasias with alteration in metabolism
Storage histiocytoses, differentiation of reticulum cells into histiocytes which store various substances, especially lipoids

Occasionally localized destructive processes develop from, or are superimposed upon, a more diffuse hyperplasia. Karsner[8] described the transformation of a clearly defined Hodgkin's disease into a definitely malignant and locally invasive tumor. Ewing designates this malignant derivative by the distinguishing term, Hodgkin's sarcoma. The rare instances in which this occurs seem to illustrate in the same individual the transformation of a reticulo-endothelial hyperplasia into a true malignant neoplasm. Similarly, the development of localized destructive tumors has been reported in association with reticulo-endotheliosis.[9]

### NEOPLASMS OF RETICULO-ENDOTHELIAL ORIGIN

Cell types which react actively in hyperplasias and which have diverse possibilities for functional differentiation would be expected to serve as a fertile source for a variety of neoplasms. Some of these are of frequent occurrence and their origin from reticulo-endothelium has been recognized for a long time, as indicated by the designation reticulum cell type of lymphosarcoma.

Other tumors of endothelioma type arising in the hematopoietic organs and presumably reproducing sinus endothelium have been the subject of many contradictory contributions.

The many errors made in the unwarranted use of the term endothelioma in the past bespeak caution in all subsequent considerations of this and of related groups of tumors. Much confusion, also, has arisen from the use of all-inclusive terms for the neoplasmoid and neoplastic diseases of the lymphoid tissues, such, for example, as lymphoblastomas and lymphadenopathies.

Rosenthal, Harris and Kean[10] have recently reported 156 cases of malignant lymphadenopathies classified in four groups:

(1) Follicular lymphoblastoma, 10 cases

(2) Reticulum cell sarcoma, 16 cases

(3) Lymphosarcoma (small or large round cell type) 50 cases

(4) Hodgkin's disease or lymphogranuloma, 80 cases

These subdivisions indicate that aside from Hodgkin's disease at least three groups of neoplasms are commonly recognized as arising primarily in lymphoid tissues.

Follicular lymphoblastoma is a relatively rare tumor, first described by Brill, Baehr and

Fig. 2
Follicular lymphoblastoma of ileum.

Rosenthal[11] under the name generalized giant lymph follicle hyperplasia. In the 3 cases described, the lymph nodes were firm and elastic with intact capsules. The individual follicles of the lymph nodes were large enough to be seen by the naked eye. The nodes were composed almost entirely of greatly enlarged and closely packed lymph follicles. Microscopically, the germinal centers were seen to be responsible for most of the enlargement, the mature lymphoid cells forming only narrow bands about the hyperplastic reticulum cells.

These nodes are evidently the seat of a marked but orderly proliferation of the reticulum cells of the secondary follicles of the lymph nodes. Symmers[12] pointed out the clinical resemblance of this process to Hodgkin's disease, but emphasized the striking difference in histologic structure and stressed the benign course even when untreated and the remarkable response to radiation. After studying 10 cases of what they now call follicular lymphoblastoma, Rosenthal and his co-workers[10] find that the earlier conception of the benign nature of this hyperplasia has not been fully sustained. In the later stages, invasion of the capsules of the lymph nodes occurs with extension into the surrounding tissues. Ultimately the involvement tends to become systemic.

The lesions develop in a group of lymph nodes or from the lymphoid tissue of the gastrointestinal tract. Whether these cases should be classed as hyperplasias of the reticulum cells of the secondary follicles or as true neoplasms of the follicular reticulum of the lymphoid tissues is not fully established, but the development of giant lymph follicles outside the preexisting lymphoid tissues and its progressive course favor a neoplastic hyperplasia.

*Reticulum Cell Sarcoma.*—Ewing[13] states that in the origin of lymphosarcoma two specific cells participate, giving rise to two specific forms of tumor. These cells are: (1) the reticulum cell of the germinal centers of the follicles and pulp cords, and (2) the lymphocyte. Thus arise two types of lymphosarcoma which may be designated as (1) reticulum cell sarcoma, or large round cell sarcoma and (2) malignant lymphocytoma.

In spite of this clear statement, it is apparent that many of the reticulum cell sarcomas vary markedly from the round cell type, and there is a well developed tendency to group these divergent growths under a more definite histogenetic term than lymphosarcoma.

Roulet,[14] in a careful study of this group of

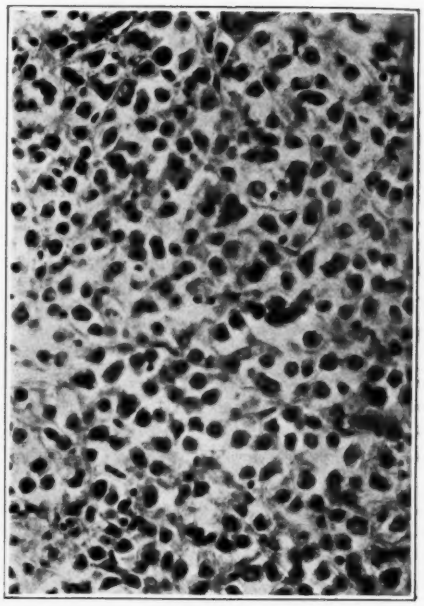

Fig. 3
Reticulum cell sarcoma of retroperitoneal lymph nodes. Many oval or elongated tumor cells.

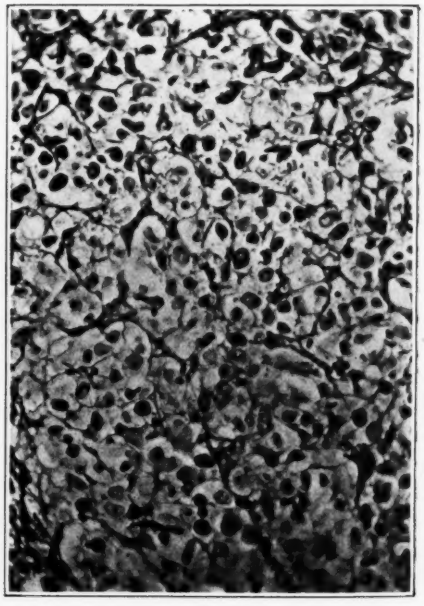

Fig. 4
Laidlaw's stain, showing the reticulum of the above tumor (Fig. 3).

tumors, which he has called reticulo-endotheliosarcomas, or retothelsarcomas, for short, has attempted to separate the tumors arising from the reticular framework of the lymph nodes from the lymphosarcomas which reproduce cells of the lymphoid type. On the basis of what he assumes to be the differentiation of the tumor cells, immature and mature forms of retothelsarcomas are recognized. The immature forms are composed of large round cells without a vascular grouping. The cells vary in diameter from 15 to 20 microns, have round or oval nuclei with cromatin in the form of granules, and prominent nucleoli. These cells form no fibrillar framework and no collagen. Roulet assumed that these tumors arose from the short spindle-shaped cells of the reticulum and probably not from the sinus endothelium. The mature forms of these tumors possess a definite tendency to form a lattice-like framework of argyrophil fibrils. The cells are definitely polymorphous and many are short spindle cells with fibrillar processes which fuse with the adjacent reticulum. All possible intermediate gradations between these two groups are recognized. All age periods between 11 years and 72 years are included.

In a later report, Roulet[15] added additional cases and emphasized his previous convictions concerning the origin of these tumor groups from the supporting reticulum cells and not from the lining cells of the lymph sinuses. He thought that a better prognosis could be ascribed to the retothelsarcomas than to the lymphosarcomas of lymph nodes. No provision was made by Roulet for tumors arising from sinus endothelium except those in which the limit is a vascular structure, such as angiomas and angio-endotheliomas, and these are of infrequent occurrence in lymph nodes.

The lymphoid tumors of the gastro-intestinal tract follow the same general patterns of those arising in lymph nodes.

Raiford,[16] in a recent review of the so-called lymphoblastomas of the gastro-intestinal tract, asserts that the histogenesis of this group of tumors is still marked by obscurity. However, he subdivides these tumors into malignant lymphocytomas and malignant reticulomas after explaining that corresponding tumor-like benign hyperplasias are occasionally observed. The malignant reticulomas or reticulum cell sarcomas are quite similar to those observed in other lymphoid tissues of the body, and evidently take their origin from the reticulum cells of the

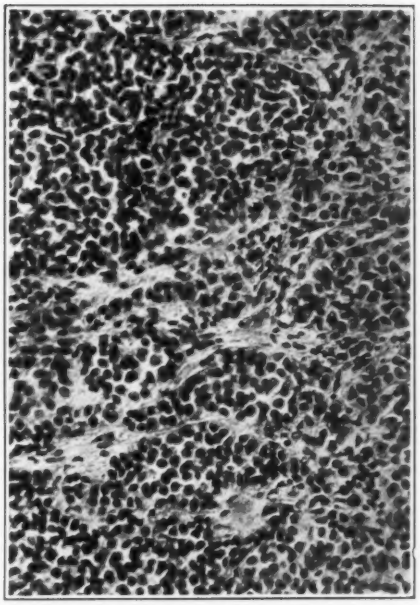

Fig. 5
Endothelioma of axillary lymph node of a man with no demonstrable tumor elsewhere.

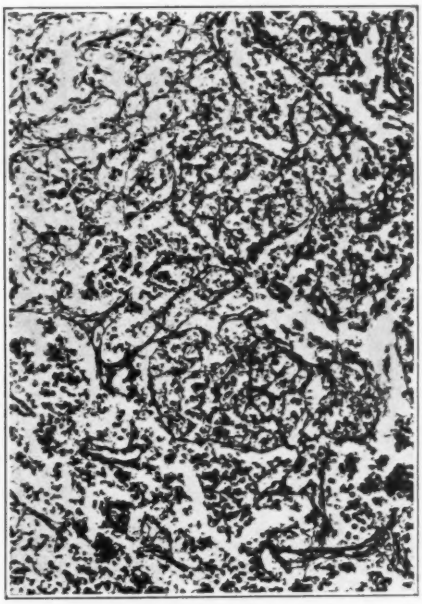

Fig. 6
Reticulum in endothelioma of axillary lymph node (Laidlaw's stain).

primordial follicles of the lymph nodules, and possibly also from the sinus reticulum.

Raiford considers the reticulomas of the gastro-intestinal tract more malignant than the lymphocytomas, and the prognosis worse because of earlier metastasis. Both types are radiosensitive.

The tumors of the thymus offer many difficulties in interpretation. Ewing[17] considered the term thymoma to be synonymous with lymphosarcoma and states that the chief source of these tumors is probably the reticulum cells of the thymus. This would seem to link this group of tumors with the reticulum cell sarcomas of lymph nodes, and gastro-intestinal tract, if it were not for the assumed epithelial origin of the reticulum of the thymus, an opinion still concurred in by Ewing[18] in 1929.

Neal,[19] in a recent consideration of malignant thymomas, states that most observers consider the thymus an epithelial organ infiltrated by lymphocytes. On this assumed embryological origin of the thymus, the 167 reported malignant thymomas are divided into two main groups, 122 being classed as sarcomas, mostly lymphosarcomas, and 45 as carcinomas.

Most of these tumors presumably arise from the reticulum of the thymus, and produce morphological structures closely simulating the tumors of reticulo-endothelium.

This similarity in behavior of the thymic reticulum is observed also in the inflammatory hyperplasias which are indistinguishable from those commonly seen in other lymphoid tissues. Hodgkin's disease also is found to arise not infrequently from the region of the thymus. Except for the uncertainties connected with the embryological development of the thymus, most of the thymic tumors would fit into the histogenetic groups here considered.

Bone marrow neoplasms offer exceptional difficulties in classification on a histogenetic basis. Conner,[20] in 1926, attempted to clarify the status of the reticulo-endothelial tumors of bone marrow in his study of the diffuse endothelial myeloma or Ewing's tumor.

He formed three groups:

(1) Angio-endothelioma, with vascular differentiation and sinus formation as seen in hemangio-endotheliomas in other regions of the body.

(2) Diffuse endothelial myeloma or Ewing's tumor, the exact origin of which is not yet clearly defined, and

(3) Reticulum cell sarcoma, in which the cells form a network of fibrils by means of fine protoplasmic processes. This third group is of infrequent occurrence as a localized tumor process arising in bone marrow.

In a recent case report, Foot and Cohen[21] have extended the limits of origin of reticulum cell sarcomas beyond the boundaries of the accepted reticulo-endothelial system. A large tumor, measuring 7.5 by 6.5 by 6 cm. and occurring in the left cerebral hemisphere of a girl nine years of age, is described as a retotheliosarcoma or reticulosarcoma.

It is thought to have originated in the perivascular and intervascular retothelium. The cells of the tumor were very pleomorphic, with spheroidal, fusiform, unipolar or bipolar forms with processes, and even cylindrical cell forms. Many enormous and bizarre giant cells were present and syncytial masses lying in a stroma of rather edematous connective tissue. The nuclei contained deeply stained but delicate chromatin network and one or more distinct and often enormous nucleoli. The stroma of the tumor had the appearance of trabeculae between which are sinusoids, simulating the architecture of the spleen. With silver impregnation, reticulum fibrils could be seen to radiate into the cell nests. Where the tumor cells were large and atypical, the reticulum seldom penetrated between them. If this diagnosis can be substantiated, it opens up many possibilities of location for reticulum cell sarcomas or retotheliosarcomas.

The histogenesis of the lymphosarcomas of the malignant lymphocytoma type has received but little consideration in recent years. When the definite relationship of the reticulum cells to the mature lymphocytes has been certainly established, it may then be apparent that the reticulo-endothelial system is thus indirectly the source of the malignant lymphocytomas. In that case, lymphatic leukemia and the lymphoid type of aleukemic leukemia may likewise hold a relationship to the tumor-like growths of reticulum cells.

Endotheliomas of the reticulo-endothelial system or reticulo-endotheliomas have offered even greater difficulties to the pathologist than the reticulum cell sarcomas in the more restricted sense.

Ewing,[22] in 1913, writing on endotheliomas of lymph nodes, pointed out that tumors derived from the endothelium and from the reticulum cells of the lymph nodes form separate well-defined and rather frequent tumors. He as-

sumed that they arose from the endothelium of the lymph sinuses and from the reticulum of the lymph cords. At that time, now 20 years ago, he emphasized the difficulty of differentiating these endotheliomas of lymph nodes from metastatic carcinoma, especially when the cervical lymph nodes are involved.

Any other demonstrable tumor must be absent and the subsequent course must indicate that no other tumor existed, and finally, the structure of the tumor must be in accord with an endothelial origin.

Very pessimistic reports concerning the recognition of endotheliomas of cervical lymph nodes have been issued by Ewing[23] and Cutler[24] within recent years. These authors rightfully stress the close similarity between the metastases of transitional cell carcinomas of the nasopharynx (and especially the so-called lympho-epitheliomas) and tumors previously diagnosed as endotheliomas. Ewing states that the frequent occurrence of precocious metastases to cervical lymph nodes, when a primary tumor of the nasopharynx exists but escapes detection, makes a heavy inroad into the field of primary endothelioma of lymph nodes and renders such a diagnosis hazardous. The structure of some of these secondary carcinomas so closely resembles that of endothelioma that the separation of the two groups of tumors on histological features is extremely difficult and often impossible. Even silver impregnation methods for staining reticulum as advocated by Foot and Day[25] have not been used successfully to separate these two types of histologically similar neoplasms. However, with all due regard to the necessary caution required in the diagnosis of endotheliomas of lymph nodes or of other regions within the reticulo-endothelial system, there is no doubt that such primary endotheliomas do occur.

In reporting one of the early cases of endothelioma of reticulo-endothelial origin, presumably arising in the lymph nodes of the groin, Foot[26] states that the tumor is considered to be an endothelioma first, because of the presence of reticulum fibers in direct relation to its cells; second, because the cells are more or less translucent, polygonal, with delicate nuclei and nucleoli that are often acidophil; third, because of its tendency to form multinucleated syncytial giant cells; fourth, because there are vacuoles in the cells which sometimes contain other cells or debris and finally, because the attachment of the tumor cells to the walls of the lymph sinuses is suggestive of endothelial origin. This neoplasm was thought to arise from the endothelium lining the lymph sinuses, as suggested by the formation of reticular fibrillae by the tumor cells. Although Foot concludes that the morphological differences between vascular and reticulo-endothelium may, after all, be merely an evidence of a difference in the physiology of the same cell due to varying reactions to varying surroundings.

Piney[3] studied the endotheliomas which tend to grow in a compact form in an attempt to differentiate angio-endotheliomas from those of reticulo-endothelial origin. He pointed out that the compact endothelial tumors were not necessarily more malignant than those of obviously vascular type, and that their component cells were not always more "anaplastic." He suggests that the cells of the compact endothelial tumors may exercise a function of fibril formation rather than of vessel formation.

The writer has recently studied an endothelioma from an axillary lymph node of a man, who had no demonstrable tumor elsewhere, so far as could be determined during life. This neoplasm had a coarse alveolar structure in some portions, while in other areas, it varied from plexiform to diffuse. The reticulum surrounding the large alveoli had little tendency to penetrate between the tumor cells; while in the plexiform portions, the reticulum was abundant and fibrils seemed to connect or arise from the individual tumor cells.

All diagnoses of endothelioma of cervical lymph nodes are being reconsidered in the light of subsequent developments in the patients, since no absolute criterion is known by which certain types of epithelium can be differentiated from the endotheliomas which do not form definite vascular structures.

The spleen is a relatively infrequent source of reticulo-endothelial tumors, although hemangiomas and hemangio-endotheliomas have been occasionally encountered in the spleen and also in the liver. Likewise, more compact tumors of endothelial type have been described from time to time. The writer[27] reported such a case before this Section last year. Secondary carcinoma was excluded in this case by the occurrence of the main massive tumor in the spleen, and the absence of a primary tumor elsewhere as revealed by autopsy. The large round cells of this tumor were surrounded in clumps or bands by strands of argyrophil reticulum with which the cells at the periphery of the clumps seemed to be loosely in contact, while the cells

at the centers of the clumps seemed to lie free in the spaces and formed no argyrophil fibrils. The tumor cells retained some of the characteristics of the cells lining the splenic sinuses and were, therefore, thought to arise from the cells of the sinus reticulum or sinus endothelium.

### SUMMARY AND CONCLUSIONS

(1) In addition to the well-known inflammatory hyperplasias, the reticulo-endothelial system is involved in systemic hyperplasias of unknown etiology.

(2) These reticuloses or reticulo-endothelioses may be leukemic or aleukemic in type.

(3) Hodgkin's disease begins as a regional hyperplasia of reticulo-endothelium and its derivatives.

(4) Comparable neoplasms arise in all the various portions of the recognized reticulo-endothelial system.

(5) Most of the tumors of the thymus appear to be of similar histogenetic origin.

(6) Reticulum cell sarcomas or retothelsarcomas may arise from histiocytes outside of the recognized reticulo-endothelial system.

(7) Functional differentiation which is partially retained in the neoplasms gives marked variation to the tumors of reticulo-endothelial origin.

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## VON RECKLINGHAUSEN'S DISEASE*

### OFTEN A DIFFICULT SURGICAL PROBLEM

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Although the literature on von Recklinghausen's disease in its various manifestations is extensive, one practical fact seems to have escaped emphasis. Patients exhibiting von Recklinghausen's disease are poor surgical risks. This is true whether the surgery to be attempted is of a general character or whether it is aimed at the correction of deformities produced by neurofibromatosis. Case reports will be cited showing the hazards of surgery although, to date, surgery in some form or other is the only treatment for this condition.

### SYMPTOMS

von Recklinghausen's disease is a complex syndrome caused by neuromata or neurofibromata which may involve practically any structure of the body. It is now frequently known as generalized neurofibromatosis and, although this term seems to give undue emphasis to one phase, fibromatous cutaneous growths, it will be used synonymously with the name of the pioneer investigator. Since a comprehensive definition is impossible, a listing of the principal symptoms will furnish the best review of this bizarre and complicated disease. These are given according to the frequency of their occurrence.

The most common symptom is cutaneous and subcutaneous tumors, which vary in size and are freely movable. They may range from a single, small lesion to many sized fibromatous masses covering the entire body. Many cases of huge, pendulous, disfiguring growths have been reported as elephantiasis nevorum and infrequently as fibromyxomata.[2 13] The tumors appear in any part of the gastro-intestinal tract, bladder, vagina and pleural cavities.[2 3] When freely movable they have been considered fibromata.[4]

Other tumors, termed neuromata, are deep seated, movable from side to side, but not up and down, with radiating pain produced when they are pulled. The nervous system may be involved, sometimes when there are no peripheral lesions, with symptoms implicating various nerve centers, plexuses and trunks. Impairment of the facial, auditory, optic, trigeminal and

*Read in Section on Dermatology and Syphilology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

vagus nerves are encountered and there may be general sensory and motor disturbances, although these phenomena are rare.[5]

Heavily pigmented blotches, sometimes called *café au lait* spots and blue spots, ranging from freckle-like lesions to large areas often resembling birthmarks and occasionally containing hair, may be scattered over the skin. They generally accompany the tumors, but may appear alone as an abortive or incomplete form of the disease.[6 7]

Endocrine disturbances are indicated by the frequent, and at times marked, generalized pigmentation occurring in connection with the disease. The suprarenal glands are implicated by symptoms resembling those of Addison's disease and by an usually lowered blood pressure. Acromegaloid changes point towards disease of the pituitary gland. Changes in the endocrine glands, together with abnormalities of the closely associated sympathetic-parasympathetic system, seem to explain the sensory disorders of arthralgic or rheumatoid pains, formications and hyperesthesias; the motor disorders of vertigos, motor incoordinations, diminution of muscular force; the psychic symptoms of mental retardation, apathy, hesitation in speech, loss of memory, melancholia, imbecility and idiocy and defects in development, sexual precocities, etc. Involvement of the vagi and sympathetics and the resulting effects on the cardiovascular system, in addition to a tendency towards a generally lowered metabolism with hypotension probably explains the shock accompanying any operation upon these patients.[1 2]

Bony changes are known in neurofibromatosis. Examples of these changes are seen in the ribs and the long shaft bones which become porous and plastic and show cyst formations. In the vertebral column the changes lead to kyphosis and torsion. The bones show decalcification without inflammation or infiltrative thickening.[10]

## ETIOLOGY

The specific etiology of von Recklinghausen's disease, as well as the origin of fibromas, is unknown. Ewing considers that many fibromas arise from misplaced islands of tissue according to Cohnheim's theory; others may depend on local irritation and disturbances in nutrition, and another group, as in neurofibromatosis, shows a definite congenital and hereditary tendency.[1 11] The disease seems to depend on a congenital anomaly of the ectodermal-mesenchymal components of the nervous system.[3] Careful staining and repeated examination of the nodules reveal both fibrous and nervous tissue.[2] It is difficult to explain the coincidence of disturbances in the endocrine system and neurofibromatosis and it is suggested that these manifestations are not dependent on each other, but both on a third factor.[9] One theory postulates that the general syndrome be grouped as an endocrine-sympathetic dystrophy having a constitutional factor which may be hereditary and an accidental factor such as trauma, or infection, which, through its effect on the endocrine-sympathetic system, acts as a stimulus to embryonal elements of the sympathetic system and the skin.[2]

## PROGNOSIS AND TREATMENT

The disease is incurable although the patients generally go along for years with little change in their condition. Surgery is indicated for all unsightly tumors and for those interfering with motility. Occasionally the pain produced by the involvement of a peripheral nerve necessitates the excision of a tumor. Sometimes the odor from sebaceous material which exudes from these large, pendulous masses is a source of great annoyance.

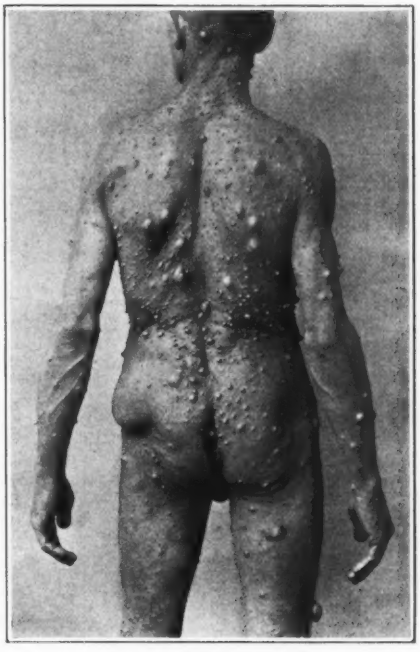

Fig. 1
Typical case of von Recklinghausen's disease showing many fibromatous lesions.

Fig. 2

Mrs. M. A., before operation, exhibiting von Recklinghausen's disease showing fibromatosis, pigmentation and pendulous mass.

CASE REPORTS

Patients with von Recklinghausen's disease are particularly susceptible to shock out of proportion to the anesthesia and surgery which they may require. They are at all times physically unstable and even minor operations should be approached cautiously. The tumors, when small, can be removed under local anesthesia, but, as they extend into the subcutaneous tissue, it is important to dissect out the entire mass, as they will recur if they are merely smoothed down to the skin surface.

Mrs. G. W. C., aged 38, a white housewife, presented typical fibromatous lesions of von Recklinghausen's disease over the neck, arms and trunk. These were from 0.5 to 2 cm. in thickness and extended up to 1 cm. above the skin surface. Four tumors on the back were cauterized down to the level of the skin, but in the course of several weeks regrew to their original size. Later these four tumors and eight others on the arms were dissected out of the subcutaneous tissue. The areas healed promptly, the tumors did not recur and the resulting scars were hardly noticeable.

Major surgery and a general anesthetic are always serious undertakings for the patients with neurofibromatosis. The accompanying collapse frequently endangers their lives and is always an unpleasant experience for the surgeon.

Mrs. M. A., aged 30, a white housewife, had nodules of various sizes and pigmented spots over her body. Her chief complaint was a large, non-painful, pendulous tumor, extending from the shoulder to the wrist on the ulnar and ventral surfaces of the left arm. This mass about equaled the size of the arm and was a source of great annoyance on account of its appearance, interference with motion and the odor from the sebaceous material which it exuded. The patient's conversation, actions and mentality were not above ten years of age and she was suspicious, garrulous and belligerent. The growth was so disfiguring, however, that she desired its removal.

Under ether anesthesia, the growth was dissected from the fascia and stripped from above downwards, hemostasis being effected step by step. The skin could not be approximated from the elbow to the hand, because of the width of the exposed surfaces, and an immediate skin graft was being prepared when the patient went into severe shock. The exposed area was covered with a large piece of folded gauze and the edges of the

Fig. 3

Family group, mother and two daughters, showing various symptoms of von Recklinghausen's disease. Central figure shows same patient as in Fig. 2 after surgical intervention.

wound were pulled together as closely as possible with silkworm sutures. Seven hundred c. c. of 10 per cent glucose and 15 minims of epinephrine were given intravenously while the patient was on the table; 7.5 grains of caffeine sodium benzoate were given subcutaneously. The shock was successfully combated, but the patient remained weak during the afternoon. That night she again went into shock and the above treatment was repeated.

Two weeks following the removal of the fibroma a successful skin graft was performed. Even this minor surgical procedure under local anesthesia caused shock and collapse.

In addition to the susceptibility to shock, a profuse hemorrhage out of proportion to the operation attempted often occurs when these growths are removed, especially from the head.

Mrs. M. McC., a white housewife, aged 31, had two fibromatous growths extending from the left malar region and from the left knee. She was referred to a surgeon for their removal. He later reported that this could not be accomplished because under general anesthesia the patient went into shock. This, in addition to alarming hemorrhage, caused him to refrain from further operative procedures.

Dr. Arthur A. Knapp, Jr.,[8] recently reported in the *Journal of the American Medical Association* a patient with a large, pendulous mass attached to the left side of the face. Two attempts to remove this growth under local anesthesia were unsuccessful because of severe hemorrhage.

## CONCLUSION

In von Recklinghausen's disease or generalized neurofibromatosis, surgery is difficult because of the particular susceptibility of these patients to shock and hemorrhage out of proportion to the operation attempted.

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## DISCUSSION (*Abstract*)

*Dr. F. J. Eichenlaub, Washington, D. C.*—From observation of several cases of von Recklinghausen's disease, I would call attention to the need of careful examination of the nervous system in these cases. I have seen two cases of brain tumor associated with this disease, and probably directly connected with it. The occurrence of von Recklinghausen's tumors in the central nervous system is fairly common, and they should be watched for.

*Dr. Harry M. Robinson, Baltimore, Md.*—It may not be amiss at this time to report my experience in one case of von Recklinghausen's disease in which we obtained desirable results by deep x ray therapy directed at the areas of major involvement. The lesions involuted markedly within two weeks after the treatment and remained so when the patient was last seen some weeks later. In view of the fact that surgical procedures were not feasible in our case, the result from deep x-ray therapy was gratifying.

*Dr. Austin W. Cheever, Boston, Mass.*—I wish to report for what it is worth an improvement that seems almost 75 per cent in a case of typical von Recklinghausen's disease treated by a Boston internist, Dr. Millard Smith, with cod liver oil and ferric ammonium citrate daily for an entire winter.

*Dr. Phillips (closing).*—I agree heartily with Dr. Eichenlaub that every case of von Recklinghausen's disease should be examined carefully for nervous system involvement as well as bone changes. Excellent illustrations of bone involvement may be seen among the scientific exhibits of the present meeting.

Dr. Robinson's experience in treating a case of von Recklinghausen's disease successfully with deep x-ray therapy is interesting; also, Dr. Cheever's report of a case greatly improved with cod liver oil and ferric ammonium citrate.

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# ARTHROKATADYSIS OF THE HIP JOINT*

*By* MOSES GELLMAN, B.S., M.D.,
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Arthrokatadysis, meaning literally "subsidence of a joint," is a term of recent coinage, suggested by Verrall[1] in 1929. When applied to the hip joint, as it originally was, it may be taken to define a non-traumatic, atypical, chronic, progressive arthritis, characterized by a sinking-in of the acetabulum and the intrapelvic protrusion of the femoral head. While arthrokatadysis is not often encountered, the severe disorganization it works upon the hip joint and the serious encroachment it makes upon the pel-

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*Read in Section on Bone and Joint Surgery, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

*From the Departments of Orthopedic Surgery of the Schools of Medicine of the Johns Hopkins University and the University of Maryland.

vis are of sufficient importance to interest both orthopedic and obstetrical surgeons.

It has been variously referred to under any number of dissimilar titles. To Otto[2] goes the credit of first describing the condition in 1824, when, in an anatomical museum, he came upon an unusual and peculiarly deformed pelvis, known since as the "Otto pelvis," which deformation he thought to be due to "an abnormal gouty manifestation." While his detailed account forms the foundation upon which subsequent studies rest, it was Henschen,[3] in 1909, who outlined its important morphological features, and Breus and Kolisko,[4] in 1912, who evolved four distinct stages in the process of its evolution.

The most recent survey of this disease is contained in an admirable article by Pomeranz[5] under the title of "Intrapelvic Protrusion of the Acetabulum (Otto Pelvis)," from which article the facts contained in the foregoing and in the discussion to follow are largely derived. He tabulated and examined all of the reported cases, adding six new ones, and commented upon the historical background, etiology, pathogenesis, incidence, symptoms and physical and roentgen findings of this condition. Though the literature on this subject is enormous, from 1824 until early 1932 the last-named author could find but seventy-nine cases, of which only forty-one were regarded by critical analysts as being truly typical. In addition to Pomeranz's six cases, four more reports[6 7 8] have been discovered in the literature up to this writing, totally eighty-nine cases in over one hundred and eight years. There is, therefore, a certain amount of justification in now presenting three cases, two of which meet the requirements for correct classification as true cases of Otto pelvis. The third resembles it closely, but lacks some of the usual criteria. It hence cannot be properly included in this particular group.

CASE REPORTS

*Case 1.*—A white man, aged 26, was seen in the Johns Hopkins Hospital Dispensary (No. K-2816).

The diagnosis, September 18, 1932, was old gonorrheal arthritis of the right hip.

In May, 1931, the patient contracted an acute gonorrheal urethritis. About one week later, while undergoing local treatment, he first developed a generalized, fleeting polyarthralgia for about thirty-six hours, after which major symptoms settled in his right hip. He had intense pain, was bed-ridden for three months on account of the involvement in this joint, and was completely disabled from pursuing his occupation as a gardener for ten months. Lately he had been able to get about and do some light work, but the hip was very stiff; he had a limp, and the pain was considerably aggravated after much walking. He had had no treatment directed towards this joint.

*Orthopedic Status.*—The patient walked with a marked limp on the right side. This thigh was greatly atrophied. There was practically no motion in the hip joint, which, for practical purposes, was ankylosed in thirty-five degrees of flexion and about five degrees of abduction. Shortening of the extremity amounted to 0.5 inch. There was no special tenderness over the involved hip, no masses were palpable externally or rectally, nor was there involvement elsewhere. The Wassermann reaction was negative. After genito-urinary consultation, chronic prostatitis and seminal vesiculitis were reported.

Roentgenograms of the right hip revealed that there was narrowing of the joint space with erosion of the cartilage of the head. The entire head, however, was relatively intact and sat deeply within the acetabulum, which bulged somewhat into the pelvis. The greater trochanter approached the ilium (*Fig. 1*).

Fig. 1, Case 1
Narrowing of joint-space, erosion of relatively intact head and intrapelvic protrusion (arrow) of acetabulum. (Outlines of x-ray slightly retouched.)

The next case, which is of intense interest, was never under my care at any time. The patient was for the first time seen by me on September 29, 1933, eight years after her initial appearance at the clinic. Shortly after *Case 1* was encountered, it was recalled that her x-rays, observed a few months before, resembled those of the first patient. Accordingly, the records were obtained and the radiographs examined. It turned out that this particular individual was by far the most important of the three, and probably one of the youngest patients with this disease thus far recorded.

*Case 2.*—A white girl, aged 7, was seen in the University of Maryland Dispensary.

The diagnosis, September 25, 1925, was coxalgia, right (Perthes' disease).

As well as can be made out from the meager history, this child began to complain of pain in the right groin in February, 1925, seven months before she came to the clinic. Her older sister, however, said later

that for at least three years the child had complained about the right hip, had limped badly, walked on her toes, and had been treated by several physicians for "rheumatism."

Physical examination in 1925, eight years ago, showed that the "general nutrition was fair, that she had a right-sided limp, marked spasm about the hip joint with absence of rotation, abduction, adduction or flexion, and a flexion-contraction of forty degrees. The right thigh and calf were smaller than the left." No further details were given on the records.

The x-ray report on September 30, 1925, showed "broadening and shortening of the neck of the right femur with slight flattening of the epiphysis. The joint surfaces were smooth. The impression is Perthes' disease."

On October 2, 1925, a long plaster of Paris spica was applied to the right hip. Between this date and September 21, 1929, nearly four years, seventeen additional casts were reapplied at various intervals, but not a single x-ray was taken to determine what was going on within the joint. When, finally, the case came under the care of another observer, still not myself, who ordered immediate radiographs, they revealed an astounding change. The head, reasonably intact, with the epiphysis closed or gone, and the neck, had pushed themselves through the yielding acetabulum, separating widely its epiphyseal components. There was some new bone formation about the neck and acetabulum, effectually incarcerating the femur within the pelvic protrusion, exhibiting a typical, advanced case of arthrokatadysis. The patient was seen yearly thereafter and on September 29, 1933, examination showed the following: the patient was small for her age (now 15). She walked with a severe limp, involving the right lower extremity, and in order to make up for nearly three inches of shortening, walked on her toes. There was no evidence of scoliosis. She had a marked increase in the lumbar lordosis and a moderate right knock-knee. There was absolutely no movement in the right hip joint, which had a fixed deformity in flexion of forty-five degrees and in adduction of about ten degrees. The greater trochanter was very prominent posteriorly and was practically on a level with the anterior-superior iliac spine. Rectal examination revealed no palpable masses (*Fig. 2*).

*Case 3.*—A little girl from West Virginia, aged 5, was admitted to the Kernan Hospital for Crippled Children. The diagnosis September 16, 1928, was tuberculosis of the right hip.

The mother was under treatment for tuberculosis of the spine. The maternal grandmother, whom this patient frequently visited, died of pulmonary tuberculosis.

During the latter part of 1926 the child developed a limp on the right side, avoided the use of this leg, had "night-cries," and complained of constant soreness in the right hip. In January, 1927, she was admitted to a hospital in West Virginia, where a plaster of Paris spica was applied which she wore for thirteen months with little improvement in the local condition, though it was stated that no weight-bearing had been allowed since the onset of her trouble two years before.

The right lower extremity showed the usual evidences of what was considered a moderately advanced tuberculosis of the right hip, with atrophy, limitation of motion, deformity and shortening.

The first set of x-rays taken on September 17, 1928, nearly two years after the onset, as well as subsequent x-rays, showed a marked destruction, broadening and deepening of the acetabulum with an almost complete absence of the capital epiphysis, the remaining head and neck having penetrated through the inwardly protruding socket and residing within the pelvis (*Fig. 3*).

About two months later, although practically all of the spasm and deformity had cleared up under constant bed traction, a typical tuberculous abscess made its appearance. It was aspirated when it seemed that it would rupture. This abscess showed no growth on the usual media and left a small, non-troublesome sinus which healed shortly thereafter.

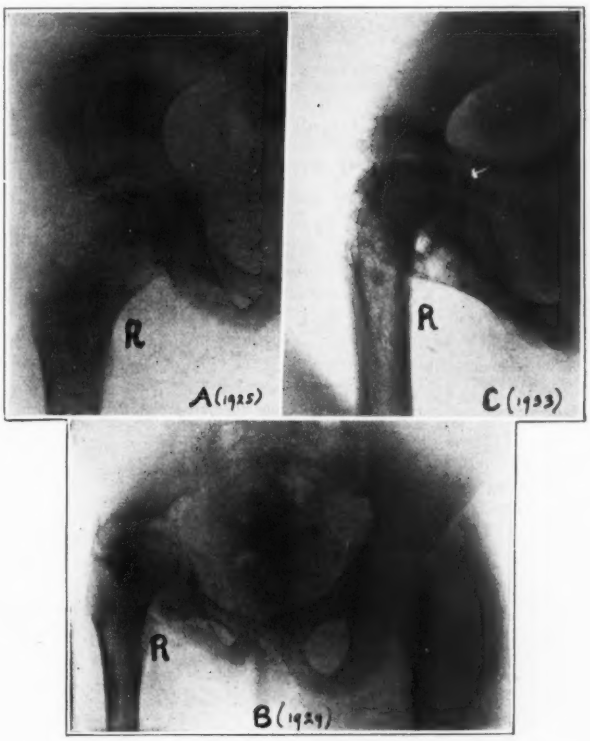


Fig. 2, Case 2

(A) Atrophy of bones with early primary involvement of acetabulum (1925).
(B) Penetration of head into pelvis through the acetabulum (1929).
(C) Osseous reconstruction of acetabular floor (1933).

Fig. 3, Case 3
Destruction of femoral head and acetabular floor with penetration towards pelvis. Absence of osseous reconstruction of acetabulum.

There was always an abnormal mobility of the joint due to the extent of the "wandering" acetabulum and the small size of the head and neck. Constant traction could not pull the femur down; hence it must have been held by some form of constricting band, soft or bony.

In December, 1929, the parents refusing a fusion operation, the child was discharged, wearing a hip-traction splint with a high shoe on the well leg and crutches. She has not been heard of since.

### COMMENTS

The history of an acute gonorrheal urethritis in *Case 1,* followed shortly thereafter by a fleeting polyarthralgia and terminating with distinct localization of a severe arthritis in one joint, the right hip, is usual in gonorrheal arthritis and leads one to the reasonable conclusion that the final condition, arthrokatadysis, was the result of a gonococcal infection. The radiographs show the typical bell-like protrusion of the inner aspect of the acetabulum, and, despite the erosion of the cartilage of the femoral head, the head is relatively intact. This is a real Otto pelvis and conforms to the cases reported by him.

Reconsidering *Case 2* in the light of subsequent events, on re-examining the original x-rays of 1925, one would be disinclined to consider this Legg-Perthes' disease, but rather would regard the process as an active arthritis of the hip joint, involving more particularly the acetabulum. There is extreme atrophy of the bones of this joint, especially of the head and neck, with no sclerotic changes. Later plates show actual progress of the destructive process which involves chiefly the acetabular surface of the joint. The changes in the femur are of secondary importance. The inward protrusion of the femur and the shell of new bone formed on the inner aspect of the acetabulum form a typical picture of intrapelvic protrusion of the acetabulum due to an infectious process, the acetabulum preceding the head in their joint deterioration. The wearing of casts continuously for four years might have contributed to the local malacial changes, but just when the protrusion took place during this long period is impossible to state.

The history of familial tuberculosis with abundant exposure in *Case 3,* the clinical findings, destructive changes in the joint, the development of an abscess, and the course lead one to the conclusion that the final changes in this hip joint were the result of a tuberculous infection. This case appears to be an example of extensive necrosis of the head and part of the neck of the femur as well as the acetabulum. In this instance the protrusion of the acetabulum is due to necrosis, but the femoral head also has been almost completely destroyed. Although the acetabulum has protruded, it has done so concomitantly with the destruction of the head. Since there is an absence of osseous reconstruction of the pelvic aspect of the acetabulum, one could not truly consider this case as the typical Otto pelvis. It is shown, however, to demonstrate the close similarity between the classical types demonstrated in *Cases 1* and *2* and a pseudotype that is more commonly encountered.

### DISCUSSION

There has been considerable conflict of views regarding this disease, due to reported variations in the pathological findings, and the wide range of etiological factors alleged to be responsible for its causations. This is but natural, since numerous transitional pathological forms and divers etiological agents have been encountered by different observers.

It was Henschen who selected as the outstanding characteristics of the Otto pelvis: protrusion of the acetabulum, elevation of the rim of the acetabulum with eburnation; preservation of the femoral head and its migration into the acetabulum, and shortening of the extremity. Four distinct stages of the process were described by Breus and Kolisko, namely:

(1) A localized destructive inflammation of the bony acetabulum.

(2) An almost complete preservation of the head and neck of the femur in its longitudinal axis.

(3) Intrapelvic protrusion of the acetabular periosteum due to pressure from the femoral head.

(4) A rapid, smooth healing, resulting in a newly

formed acetabular floor and a permanent dome-shaped intrapelvic protrusion.

It is my feeling that *Cases 1* and *2* answer these requirements satisfactorily.

These investigators, including Henschen, believe the extension of the acetabular floor occurs during the initial stage; that development of the dome-shaped periosteum takes place during the intermediate stage; and that during the terminal stage periosteal ossification with definite Otto protrusion may be observed. This last phase may be succeeded by various secondary bony changes in the joint, by hyperostosis, sclerosis, partial or total synostosis. Some are convinced that in the development of this disease the outstanding changes occur in the acetabulum, the femoral head being relatively uninvolved or secondarily so; others have found the predominating changes in the femur, the head in some instances being practically denuded of cartilage and covered with granulations.

When one comes to discuss the etiology of arthrokatadysis, there is a much broader divergence of opinion. As these notions are sifted, among the larger majority of observers there is found a feeling that this condition is not a distinct disease but a clinical entity, the end-result of an inflammatory or degenerative process within the hip joint.

Bacterial agents, including the tubercle bacillus, streptococcus and gonococcus, are held to be involved in its development. Such conditions as tabes, lues, metastatic maligancy, the arthritidides, the gouty diathesis, various forms of osteitis, coxitis, chrondal dystrophies, echinococcus, trauma and endocrine disorders are among other factors believed, from the etiological standpoint, to be actively concerned. While it cannot be gainsaid that individual or even several cases may be reasonably regarded as due to any one of the single causes enumerated above, Pomeranz[9] is emphatic in establishing this fact:

"that the condition may be produced by any process which involves essentially the acetabulum and leaves the femoral head intact. Stated otherwise, any disease resulting in a localized osteomalacia of the acetabulum can produce the deformity, provided the femoral head maintains its boring qualities. The destructive process, however, must not be too severe and must permit bone regeneration."

Of all the cases of proven gonorrheal and tuberculous arthritis of the hip joint that are seen, very few eventuate in arthrokatadysis. It is the experience of most orthopedic surgeons that gonorrheal joints are acute, destructive and often result in ankylosis. In tuberculosis the process has a tendency to be chronic, destructive and to eventuate in ankylosis. Why, then, do we not encounter more of this type of case? Pomeranz believes that, if, in the above conditions, the femoral head and acetabulum both partake in the process simultaneously or are involved in a co-relative equality and severity, the usual type of arthritis ensues which is readily recognizable. On the other hand, arthrokatadysis is in reality also an arthritis, but of a distinctly atypical sort, however and by whatever produced. It depends for its development mostly upon the accidental primary involvement of the acetabular surface of the joint in advance of the femoral head. The head, retaining the whole or most of its integrity, assumes a boring quality and by pressure, aided and abetted by muscle spasm, contractions, motion, weight-bearing or trauma, causes the intrapelvic protrusion of the acetabular floor, which, with the osteogenic proliferation that follows, permanently completes the picture of this peculiar deformity.

A careful study of the development of *Case 2* confirms Pomeranz's ideas concerning the formation of this condition. The fact that these two cases and the pseudo-condition in *Case 3* are of manifestly different etiology, also tends to strengthen his conclusion that "we must abandon our conception of the specificity and individuality of this lesion."

I wish to express my indebtedness to Dr. Pomeranz for his excellent review and discussion and for his courtesy in personally examining and commenting upon the protocols and radiographs of the cases herewith presented.

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# INGUINAL HERNIA: STANDARDIZING TECHNIC FOR OPERATIVE REPAIR*

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Every surgeon strives, in his operative work, to perfect and acquire a routine technic for various operative procedures by which dependable results may be achieved. This is what is usually meant by standardization of operative technic. That operative technic for repair of inguinal hernia is not yet broadly standardized is evidenced by the fact that I have found in the literature since 1863 two hundred and forty-seven monographs on the surgical cure of inguinal hernia, in each of which the author advances a new, improved or different method of operative procedure.

Marcy, whom I had the privilege of knowing pleasantly in the last two decades of life, made the first dependable contribution for the operative cure of hernia in 1881. His advocacy of anatomical suture was the foundation upon which have been built all the modern methods of operative technic. Next followed the method of Bassini in 1888 and 1893. The Bassini operation, without its many modifications advanced by others, has more completely met the demands of standardization than any other method reported to date. In 1895, Andrews presented his method of imbrication, which soon proved to be unsound. The same year Halstead sought to close the external ring by transplanting the cord outside the external oblique fascia, but withdrew this suggestion in a paper published in 1903. In 1902, L. L. McArthur was the first to advocate the use of a fascial suture taken from the aponeurosis of the external oblique. Strangely, due credit has not been generally given McArthur for this advanced idea, yet the principle has done more than any other to standardize and perfect the technic for repair of inguinal hernia. Besides the splendid adaptation of fascia for sutures, advanced by Gallie in 1921, there has appeared only one other contribution of outstanding interest and this was the Ferguson technic published in 1899. Ferguson advocated that the cord be left undisturbed in its bed on the transversalis fascia. This also proved unsound because the inguinal canal was not obliterated. The external ring remained unchanged and there was direct recurrence in from 10 to 15 per cent of cases after the operation.

Routine standards in the operative cure of inguinal hernia must necessarily stand or fall on the question of recurrence. Recurrence of hernia after operation for the oblique types is given as ranging from 1 to 10 per cent. A fair average would be about 6 per cent and Ricketts reported 5.58 per cent recurrence from a study of 6,000 cases. Direct hernias give a postoperative recurrence of 16 to 20 per cent, yet some say the true figures should be from 25 to 50 per cent. Davis reported a study of cases from the Massachusetts General Hospital in which recurrences were 8 per cent in the oblique types and 15 per cent in the direct types. Lameris studied 511 inguinal hernias after operative repair and found recurrence in the oblique type to be 9.3 per cent and 27.4 per cent in the direct type.

Nearly all writers agree that recurrence is definitely related to the method of handling the cord. Halstead pointed out that the lowest

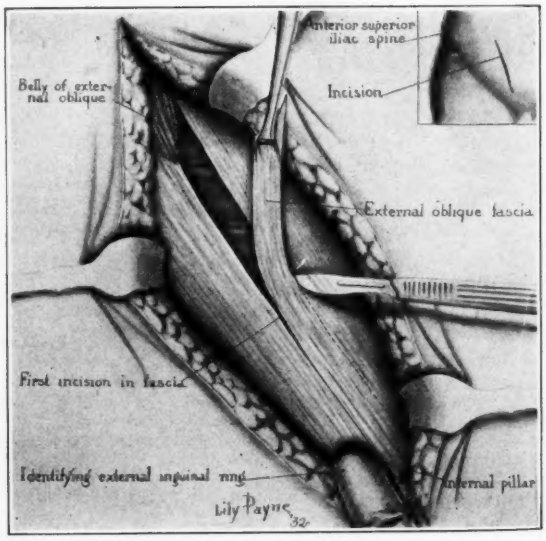


Fig. 1

The skin incision is more vertical than that usually made. The incision through the external oblique aponeurosis is shown, and the method of cutting out the fascial suture from the inner leaf which is left attached at the pubic bone.

*Read in Section on Railway Surgery, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

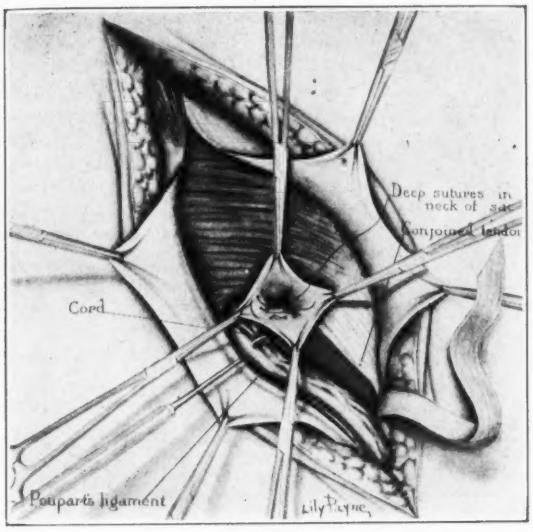


Fig. 2

The fascial suture is shown. The sac has been freed, contents have been reduced, the main portion of the sac trimmed away and the neck of the sac closed by sutures at the highest point and on a level with the parietal peritoneum.

number of recurrences is found when the cord is transplanted and higher figures occur when the cord is not transplanted.

The first premise in standardizing an operative technic is that the defect through which the hernia protrudes be closed. In accomplishing this some disposition of the spermatic cord must be made. Five methods of disposing of the cord have been advocated as follows:

(1) It is placed behind the parietal peritoneum and within the abdominal cavity.

(2) It is placed between the peritoneum and transversalis fascia.

(3) It is left on its original bed of the transversalis fascia.

(4) It is transplanted on a new bed composed of the conjoined tendon and internal oblique muscle which have been sutured to Poupart's ligament

(5) It is brought out through the aponeurosis of external oblique muscle and transplanted under the subcutaneous fat and skin.

Methods 1, 2 and 3 are fundamentally unsound, as they necessitate a weakness at the point where the cord emerges and therefore give a high number of recurrences. Method 4 is the safest for adoption in a standardized technic. It provides for a satisfactory protection of the cord and permits a more secure closure of the hernial defect at its lowermost angle, where postoperative weakness is most prone to occur and at the point where recurrences usually take place. Transplantation of the cord under the skin is rarely used, for it is conducive to undue angulation, strangulation, traumatism and frequently testicular atrophy.

The physiological tone of the structures used in closure of the defect must be maintained; therefore careful preservation of the ilio-inguinal and ilio-hypogastric nerves is necessary, as these nerves supply the internal oblique and transversalis muscles, and injury to them

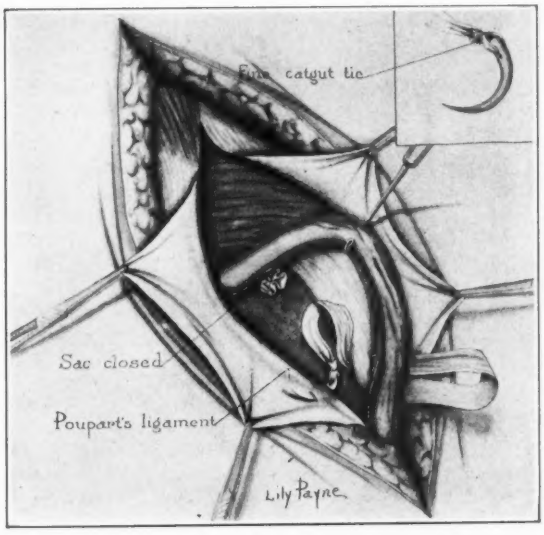


Fig. 3

The fascial suture has been threaded on a large fascial needle and fixed with a simple catgut tie. The fascial suture is then passed under the cord and approximation of the conjoined tendon to Poupart's ligament is begun. This provides a new bed for the cord and obliteration of the external ring.

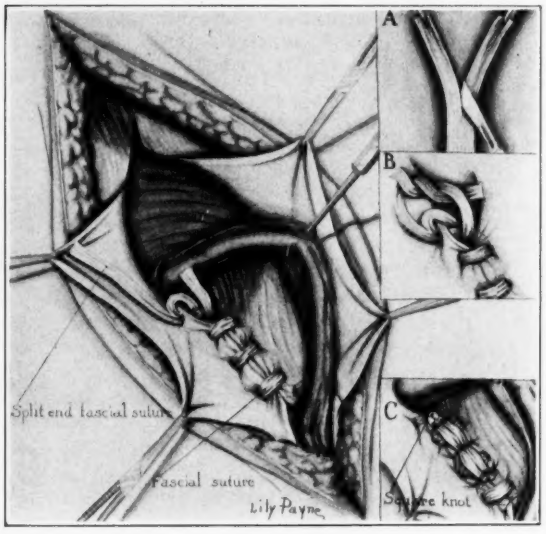


Fig. 4

Closure of defect is accomplished by approximating the conjoined tendon and internal oblique to Poupart's ligament with the fascial suture. The free end of the fascial suture must be securely anchored.

Insert, A. Method of splitting the free end of the fascial suture.

Insert, B. Method of fixing the split ends by a square knot.

Insert, C. After the square knot is tied the split ends are turned down and silk or chromic catgut No. 2 is passed under the fascial suture and tied snugly over the loose ends. At the lowermost angle a suture passes through the conjoined tendon, the triangular ligament and Poupart's ligament, thus further completing the obliteration of the external ring. The cord is left on this bed and the external and internal leaves of the external oblique aponeurosis are approximated over the cord by interrupted sutures without overlapping.

will cause atrophy and weakness sufficient to produce recurrence of the hernia. Overlapping or imbrication of the external oblique fascia is thought by the majority of surgeons to be of doubtful value. This is attained generally by tension of the fascia and since the fibers of this aponeurosis run parallel with the operative incision through it, one can easily conceive how sutures under tension, and at right angle to the fibers, would produce tearing and separation.

From a consideration of these historical facts I would like to postulate as follows:

(1) The ilio-hypogastric and ilio-inguinal nerves must be conserved. If they are conserved, less atrophy of structures used in the repair results.

(2) Overlapping or imbrication of the aponeurosis of the external oblique is contraindicated because this cannot be obtained in the majority of cases without strain on the fibers which run longitudinally. Tension tends to weakness and separation.

(3) Utilization of the cremaster muscle in repair and attempts to plicate the transversalis fascia are worthless.

(4) In closing the hernial defect the circulation and structures in the cord must be interfered with as little as possible. Transplantation of the cord behind the transversalis, on the transversalis or in front of the aponeurosis is unsound for a routine standardized technic.

(5) Absorbable sutures alone cannot be depended upon for permanent repair; therefore fascial transplants or heavy silk are more dependable than catgut.

The technic herein illustrated has been used routinely by me and my assistants since 1924 and is presented to meet, as nearly as possible, all of the above postulates. I have been able to follow two hundred hernias repaired by this method and the results have been more satisfactory than from any other method tried by me. The criterion of efficiency is based upon a judgment of results on no case less than two years old. There has been one recurrence, at the fourth week after the repair, following a severe fall incited by acute alcoholism. One of the most important points in the method illustrated is the strong fixation of the fascial strip. Its normal attachment is preserved at the lower end and the free end must be fastened by a secure knot which is strengthened by catgut or silk ties as illustrated. Gallie emphasizes this feature and points out that failure in anchorage is a cause of recurrence. This method of repair, adopted by me as a standard routine, is not proclaimed as a new or improved procedure. The technic merely includes steps and principles which have been utilized for a long time in the handling of the problem. In large, recurring hernias we do not hesitate to employ fascia lata, but would stress the point that these transplants be fixed at both ends with square knots and silk.

Finally, I am cognizant of the fact that many surgeons have large numbers of cases successfully repaired by utilizing certain steps which I have decried in this offering. I have had a similar experience. However, the younger generation of surgeons, especially those going through a surgical apprenticeship in our general hospitals, are completely bewildered by the

many different steps advocated for repair of inguinal hernia and accordingly I have adopted the method herein illustrated as a routine. It may not be the best repair, but it embodies all of the sound principles known to me and eliminates all steps which, in my experience, are considered to be unsound.

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DISCUSSION (*Abstract*)

*Dr. J. W. Henson, Richmond, Va.*—The inguinal canal was designed for a special purpose by the Master Intelligence. Halstead, in one of his papers on hernia, said: "Imitation of the inguinal canal, either anatomically or physiologically, is impossible by us." Let us examine some of the features of the inguinal canal and its contents.

The internal ring is not a hole punched in the transversalis fascia. It is the upper end of a glove-finger-like process of this fascia, surrounding the structures of the cord, running downward and inward external to the transversalis fascia and parallel with it. It is kept rather sharply bent at its point of entrance into the abdominal wall by the opposing forces of intra-abdominal pressure on the one hand, the internal oblique muscle and the aponeurosis of the external oblique in their normal state of tension on the other hand.

The internal oblique muscle covers the outer or upper one-third of the inguinal canal and in straining efforts it contracts forcibly against the exaggerated intra-abdominal pressure, accentuating the angle at the upper end of the tube-like process of the transversalis fascia, thus closing temporarily the so-called internal ring: a mechanical principle illustrated in the sharp bending of a rubber tube. While the transversalis fascia is very thin toward the diaphragm, it becomes stronger lower down, especially in the inguinal region (Deaver, Gray and other leading anatomists).

It is of importance as a part of the posterior wall of the inguinal canal and in supplementing the resistance offered by the triangular ligament and conjoined tendon to direct inguinal hernia.

Leaving out of consideration the unclosed infundibuliform process of the peritoneum, any one of the structures mentioned above, by deficiency or loss of tone, may be a cause of the development of inguinal hernia. When the transversalis fascia around the upper end of the inguinal canal loses its tone, becomes thin and relaxed, every straining effort makes the so-called internal ring descend a little lower until it passes beneath the protection of the internal oblique muscle, and the process from the transversalis fascia gradually or suddenly, as the case may be, loses its normal angulation at the upper end and we get a hernia.

The internal oblique may lose its tone, or may never have had the proper tone, or it may not be attached to Poupart's ligament as low as it should be (Ferguson). If the upper end of the inguinal canal does not receive the support it should, the transversalis fascia gradually relaxes, the so-called internal ring descends until it passes below the internal oblique muscle, and gradually or suddenly a hernia develops because of this loss of support.

The transversalis fascia behind the lower end of the canal may lose its strength or the triangular ligament and the conjoined tendon may lose their tone, providing the conditions for a direct inguinal hernia.

Since the Master Mind has fashioned a canal so perfect that we cannot imitate it, why not reconstruct it? That the canal is perfect is evidenced by the fact that there is no inguinal hernia unless there is a congenital or acquired defect.

For several years the plan I have followed in operating for oblique inguinal hernia is (after disposing of the sac) to decrease the size of the internal ring and elevate it by doing the stitching from below, and reconstruct the transversalis fascia as the floor of the inguinal canal. If, as happens in rare instances, this fascia is too thin to be utilized the anterior sheath of the rectus muscle is made to serve. The cord is dropped into its original bed and by one or two mattress sutures of No. 2 chromic catgut the internal oblique muscle is attached lower down on Poupart's ligament, thus increasing its support of the internal ring.

Though the number of cases of hernia I have had is much smaller than many surgeons, my records show only one relapse and this was due to infection.

There, of course, may be a number that relapsed and fell into the hands of other surgeons. I have no objection to offer to fascial sutures, but so far have never had occasion to use them.

*Dr. Edward T. Newell, Chattanooga, Tenn.*—While I believe that the principal factor in the cure of inguinal hernia is in the making of a substantial floor, a conjoined tendon to the shelving portion of Poupart's ligament, I must say that I consider as second in importance the high ligation of the sac.

In Holland, many Dutch surgeons rely solely upon high ligation of the sac for the cure of inguinal hernia. However, I do not agree with them in that respect. I was very greatly impressed in 1926 when I saw Professor Marion Donati do the typical Bassini operation in Bassini's old clinic at Padua.

Two points worth mentioning in the technic of repair of inguinal hernia are: transplantation of the cord with as little trauma as possible; and suturing of the tissues securely, but lightly, under strictest asepsis, and the application during the performance of the typical Bassini operation of suitable retractors at the lower and upper aspects of the wound. The retraction at the lower angle enables one clearly to outline the external ring, and the traction at the upper angle permits one to ligate the sac high and also to apply easily the first suture which should be above the cord, and which should not constrict the cord in the least.

Nearly all of our hernia operations are done under local anesthesia by choice.

*Dr. Payne (closing).*—It is evident from these discussions that both Dr. Henson and Dr. Newell employ entirely different methods for repair of inguinal her-

nia. This serves merely to emphasize the lack of standardization of technic as noted in my paper.

Most recurrences after hernioplasty take place at the lowermost angle of the repair at the location of the external ring. I feel that it is most important to obliterate the external ring and this is not accomplished when the principles of the Ferguson technic are followed and the cord is left on its original bed of transversalis fascia.

One cannot make a comparison between the use of absorbable sutures in hernial repairs and fascial implants as sutures. Fascia is not absorbed, never dies, and if properly anchored forms a strong and permanent buttress across the defect.

The method described by me is presented as a standardized technic for routine adoption because of its simplicity, facility of accomplishment and the satisfactory results.

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## MASSIVE RENAL CALCULI IN ASSOCIATION WITH NUTRITIONAL DISEASES*

*By* GROESBECK WALSH, M.D.,
*and*
E. M. NORTON, M.D.,
Fairfield, Alabama

A review of the literature reveals little evidence that deficiency in any important principle of metabolism is causative of urinary calculosis. There is a fair amount of literature to show that urinary calculosis, especially renal calculus, is associated with unbalanced or defective nutrition, particularly an imbalance in vitamins, causing defective mineral metabolism. But, while this fact is generally acknowledged, there is not complete agreement among authors regarding the particular vitamin or vitamins whose absence or excess is responsible for the disturbance.

Early German investigators, notably Pfannenstiel,[1] and H. Kreitmar and T. Moll,[2] attributed kidney calculosis to excessive administration of vitamin D, the vitamin the presence of normal quantities of which in the diet is deemed necessary for proper deposition of calcium and phosphorus in the bones.

Some English investigators, especially Osborne and Mendel,[3] took the view that urinary calculosis is associated with deficiency or absence of the fat-soluble vitamin A. E. C. Van Leersum,[4] of the Netherlands Institute of Nutrition, Amsterdam, agrees with the British investigators. McCarrison[5] favors the idea of general avitaminosis.

W. E. Dixon and J. C. Hoyle[6] made extensive animal investigations in this subject. They entirely disagree with the idea that the absence or presence of deficient or excessive fat-soluble vitamin A has anything to do with the matter. Their control animals were fed a well-balanced mineral and vitamin diet in every way comparable with that of other animals experimented upon, except that to them was given an extremely large dose of viosterol (vitamin D). Rabbits fed excessive vitamin D died within twenty days after oral administration of the excessive amount of 1 mg. daily. Guinea pigs fed the same amount died within ten days. On autopsy the characteristic changes observed were: in all animals that died the spleen was atrophic and there were deposits of calcium in the internal walls of the heart, muscles, stomach, lungs and kidneys. These changes were quite different from the pathologic changes brought about in other ways involving arteriosclerosis.

Authors discussing the general question say that when the diet is defective stone formation is relatively easy to produce, and it may be said that a dose of viosterol, which is without effect on well nourished animals, may give rise to urinary calculi in those badly nourished.

Although we have not been able to find reported in the literature any case of kidney calculosis directly attributable to pellagra or pernicious anemia, three of the four cases we are reporting are pellagrins.

We have been very much interested and rather surprised that renal calculosis is found in connection with these nutritional diseases rather than that they should be coincidental with biliary calculosis. We should imagine *a priori* that nutritional diseases and gallstones would be more frequently associated than the complex which we have reported. We should be inclined to think that very possibly because we know little as to the causes which bring about calcium deposits in either the kidneys or the gallbladder.

Though we have gone over our nutritional disease cases and our gallstone cases with some degree of care, we have been unable to find any definite connection between the two disorders. If it is the presence of the stone which excites unusual distaste for food and abstention from food substances necessary to the preservation of health, we should expect to find this condition

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*Read in Section on Medicine, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

*From the Medical Section of the Employees' Hospital, Fairfield, Alabama.

produced much more frequently by calculi in the bile tracts than in the renal tracts; but we have been unable to find any such connection. Whether the nutritional disease and the formation of the calculi proceed simultaneously, or whether the nutritional disease antedates the formation of the calculi, of course, is nothing but pure theory. We have no ideas to advance on the subject.

We have observed in this hospital the frequency with which renal stones accompany or follow gross fractures of the spine or pelvis. These stones have been known to come with startling promptness, and at times have occurred bilaterally. As indicative of this fact, attention is directed to the contribution of Conwell,[7] describing one hundred cases of fracture of the spine without cord injury. He notes the fact that 8 per cent of one hundred cases reported had developed renal calculosis when last examined. Five of these cases followed fracture of the lumbar spine; three followed fracture of the dorsal.

*Case 1.*—Mrs. N. G., *Case 76152*, a white woman, age 39 years, housewife, was admitted to the Employees' Hospital on January 14, 1933, complaining of pain in the right abdomen. She said that she had been having intermittent attacks in the right abdomen for the previous ten years. She had not noticed any frequency or nocturia, but had at times passed cloudy urine. The patient had never had any digestive disturbance other than the nausea associated with the attacks of right sided pain. Her menstrual cycle was normal. The patient had been extremely nervous, her nervousness characterized by inability to stand unusual noises. Little things worried her. She became fretful with the children without cause and was usually inclined to pity herself.

Fig. 1, Case 1

Her appearance was anemic. Her weight was 101 pounds, height 62½ inches. Six months previously she weighed 116 pounds. She was well developed, but poorly nourished. There was no history of previous operations or injuries. Her tongue was slick, red and fissured. Her teeth were in fair condition, but her gums were somewhat involved, with a generalized gingivitis. She complained of numbness and burning of both hands and feet and paresthesias as high as the knees and elbows. There was no change from normal in the superficial or deep reflexes. The skin over the dorsal surface of the feet was rather brown and scaly. The same condition existed over the elbows. The dorsal surfaces of the knee were not scaly, but the skin was somewhat darker than normal. The blood pressure was 145/100.

X-ray examination showed a large right-sided renal stone, with several smaller densities probably in the lower pole.

The diagnosis of pellagra and renal calculus was made.

The patient was operated upon on January 27, 1933, a right nephrectomy being done.

She has a characteristic redness of the vaginal mucous membranes often found in pellagra.

*Case 2.*—Mrs. M. G., *Case 17801*, a white housewife, age 38 years, was first admitted to the Employees' Hospital on January 9, 1924. She was admitted for repair of a fecal fistula, which followed a pelvic operation thirteen months before this admission. During the course of the examination a large abscess was found in the lower lobe of the right lung. This lung condition consumed the entire attention of the Staff during her stay in the hospital. The abscess was drained and irrigated over a period of five months, with eventual recovery. The fecal fistula healed spontaneously.

She was readmitted October 3, 1932, *Case 74735*. Her symptoms were characteristic of a stone in the left kidney. These symptoms consisted of pain in the left flank, radiating down the left thigh, and a loss of forty pounds in weight during a period of eight months. X-ray plate revealed a large renal calculus; and a nephrectomy was done on October 11, 1932. Red blood cell counts during this admission showed 4,875,000 and 5,700,000. The hemoglobin varied from 70 to 75 per cent. In addition to the condition in the left kidney, the patient on admission on this occasion complained of nervousness, numbness, coldness, and parasthesias of both feet and hands. Her tongue was red and slick. No skin lesions were noted at that time.

The patient was readmitted to the hospital on November 29, 1932, *Case 75558*. On this occasion the evidences of pellagra were much more definite. In addition to the nervousness, numbness, paresthesias and burning of her hands and feet, there was darkening of the skin in the areas around the elbow joints. The tongue still retained the picture characteristic of pellagra. Red blood cell counts on this last occasion were:

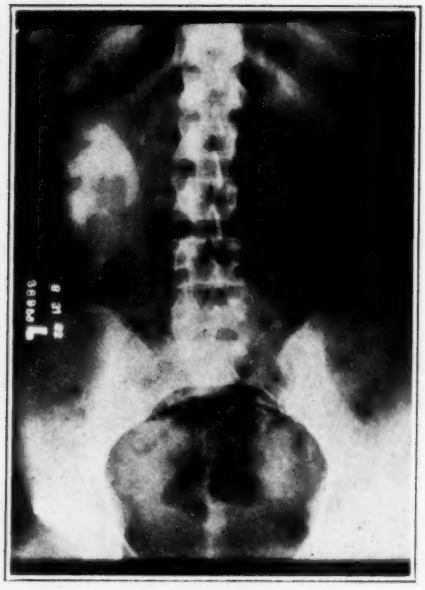

Fig. 2, Case 2

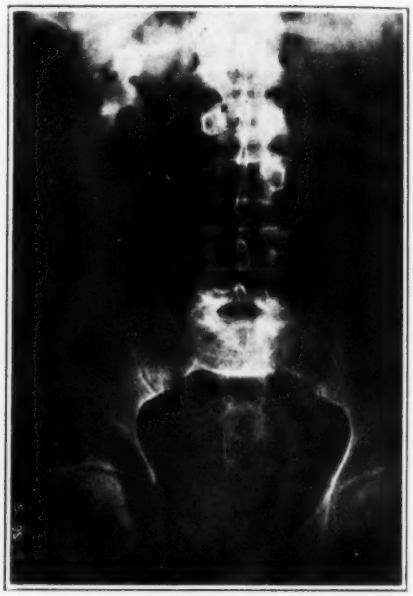

Fig. 3, Case 3

3,500,000 and 3,600,000. Gastric analysis showed free hydrochloric acid 30 and combined 20.

*Case 3.*—E. H. G., *Case 10805*, a white man, age 52 years, foreman, was first admitted to the Employees' Hospital on September 9, 1922, and discharged on October 22, 1922. A large peri-urethral abscess was incised and drained. Convalescence was uneventful.

The patient was readmitted to this hospital on July 18, 1927, and discharged on August 5, 1927, *Case 41336*. The diagnosis was pernicious anemia. The patient had suffered a weight loss of thirty pounds in the six months prior to admission. He complained of weakness, digestive disturbance of various sorts for the previous two years, with some regurgitation of food and gastric distress largely nocturnal in character. He had been diagnosed as a case of pernicious anemia before admission, and had been given arsenic. The urine showed albumin on numerous occasions in large quantities. Hemoglobin readings were 35 and 40 per cent. Red cell counts were 1,125,000, 1,150,000, 1,125,000, and 1,100,000. Examination of the blood cells showed a picture characteristic of pernicious anemia. There was no free hydrochloric acid in his gastric contents. On this occasion a flat plate of his abdomen showed a large stone completely filling the pelvis of the right kidney. He was discharged with dietary instructions in vogue at the present time.

He was readmitted to this hospital on October 5, 1928, and discharged on October 25, 1928, *Case 49600*. Despite the fact that he had been on liver extract, his red blood cells showed a marked decline, successive readings being 950,000, 900,250, 1,200,000, 1,050,000, 1,475,000, and 2,000,000. Under a dietary regime the patient showed marked improvement.

He was readmitted to this hospital on April 19, 1929, and died in the hospital on April 24, 1929, *Case 53112*. He had shown a rapid decline since his discharge from the hospital on the previous occasion.

*Case 4.*—Mrs. I. B., *Case 6385*, a white housewife, age 39 years, was first admitted to the Employees' Hospital on July 11, 1921, and discharged on July 23, 1921. The diagnosis was pellagra. She complained of nervousness and burning pain in the stomach, these symptoms becoming worse in the spring of the year. She suffered from insomnia and periods of profound depression without cause. During the summer months she ate large quantities of ice cream, habitually, to relieve the gastric distress. (This is a common habit with pellagrins in this locality.) She weighed 104 pounds, against a standard weight of 138 pounds and a weight of 115 pounds six months before admission. The tongue was sore and red. The blood pressure was 125/80. There was some tenderness over the left kidney.

Since this first admission the patient has been readmitted to this hospital on numerous occasions, mostly for symptoms related to her gastro-intestinal tract.

She was readmitted to this hospital on October 6, 1925, *Case 29299*. A supravaginal hysterectomy was performed at this time for an enlarged and myomatous uterus.

During another admission in the year 1925 her principal complaint was cystitis, with large quantities of albumin in the urine, a fiery red tongue, and marked nervousness.

She was not seen between the dates of January 9, 1926, on which occasion she was discharged, and January 2, 1929, when she reentered the hospital with symptoms of pyelitis of the left kidney. She was still

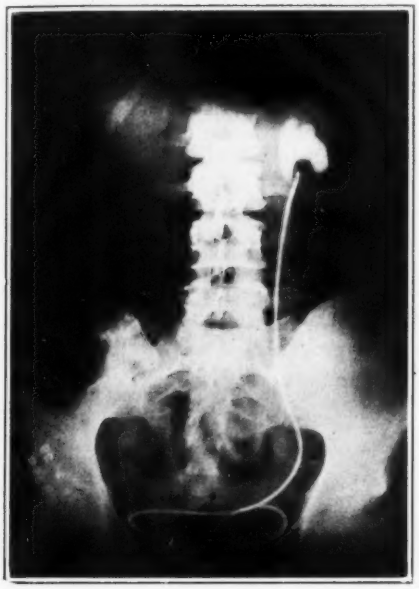

Fig. 4, Case 4

extremely nervous. Her tongue was very red, slick, and fissured. An x-ray plate of her abdomen showed a large stone completely filling the pelvis of the left kidney. A standard nephrectomy was done January 19, 1929.

She has been readmitted to this hospital once since then, showing some evidence of involvement of the right kidney. The nervous symptoms, redness and slickness of the tongue and redness of the vaginal mucosa still persist.

## SUMMARY

(1) Four cases of massive renal calculi associated with nutritional diseases are presented. Three of these cases have occurred in connection with pellagra. One case occurred in connection with pernicious anemia.

(2) Attention has been called to the frequency with which renal calculi follow fractures of the spine and pelvis. It is suggested that the fragility of the bones, which accompanies nutritional disease, may so upset calcium metabolism as to make renal calculosis fairly common.

(3) While no definite proof has ever been adduced to show any particular vitamin or vitamins in fault in the production of renal calculosis, the weight of evidence seems to lean toward deficiency in vitamins A and D. The advisability of a diet high in vitamin content in individuals who have shown a tendency to renal calculosis is self-evident.

(4) We have been unable to see any connection between the findings in these patients and any known evidence of hyperparathyroidism.

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## DISCUSSION (*Abstract*)

*Dr. C. Sidney Burwell, Nashville, Tenn.*—Some years ago a physician brought to the chemical laboratory of one of my friends a handful of small objects. He said they were renal stones, and requested that they be analyzed. My friend spent several days attempting to dissolve them by using various solvents without success. They remained insoluble. At the end of this time the doctor apologetically returned and reported that he had been deceived, that the patient was abnormal mentally and that her report concerning the origin of the stones was not correct. As a matter of fact, she had picked them up in the garden. This woman had pellagra and her psychiatric condition was due to her disease. So in this case there exists a relation between nutritional disease and calculi.

As a matter of fact it is not difficult to establish a relationship between nutrition and stone formation. Viosterol in an excessive amount may lead to widespread calcification with the formation of calculi in the kidneys. The observations of Osborne and Mendel, McCarrison, van Leersum and Fuzimaki appear to indicate that in animals a diet distinctly deficient in vitamin A may be associated with the formation of calculi in the kidneys. Moreover, we know that stones appear in hyperparathyroidism and Turner has shown that certain pellagrins have some elevation of the blood calcium.

Whether any of these facts is important as regards stone formation in patients is another matter and concerning this we have almost no evidence, but only speculations. One can surmise that an A-deficiency might lead to changes in the epithelium of the kidneys and the desquamated and altered cells may serve as the nucleus of stones. One can surmise that abnormalities in the diet might lead to important changes in reaction of the urine. It seems to me quite impossible to draw any conclusions.

*Dr. Harvey G. Beck, Baltimore, Md.*—That certain physical conditions and nutritional states can be productive of renal calculi, need no longer be doubted. Hertoge, years ago, pointed out the fact that renal calculi, as well as other urologic conditions, occur much more frequently in individuals suffering with myxedema. It is also an established fact that the condition occurs in diseases due to altered calcium metabolism, for example, in Paget's disease. The same holds true in certain conditions associated with disturbance of the parathyroid glands.

*Dr. Frederic M. Hanes, Durham, N. C.*—The possibility of hyperparathyroidism is worth considering in cases such as these. The occurrence of renal calculi may be the first clinical intimation of hypercalcemia. Only by repeated calcium and phosphorus determinations, together with x-ray bone studies, can one arrive at a conclusion. We are learning that hypersecretion of parathormone is not a rare condition, and may present a very varied symptomatology.

*Dr. Walsh (closing).*—Dr. Norton and I have talked over several times the fact reported in Dr. H. Earl Conwell's series of fractures of the spine. As both of us daily see large numbers of x-ray plates, we have been struck with the circumstance that osteoporosis and implied fragility of the bones, including of course the bones which make up the veretbral column, is an invariable concomitant of nutritional diseases.

We have speculated together more than once as to whether or not this fragility in such large and important bony structures as the vertebral bodies, structures which are exposed constantly to varying degrees of trauma, even in the routine of our daily lives might not so upset calcium metabolism as to tend easily toward formation of renal calculosis.

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## EXTENSIVE BILATERAL RENAL CALCULOSIS OF RAPID DEVELOPMENT FOLLOWING FRACTURE OF THE VERTEBRAE*

### DISCUSSION OF POSSIBLE ETIOLOGIC FACTORS

*By* Roy J. Holmes, M.D.,
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Since the dawn of urology most of us have held tenaciously to the view that the chief factors in the production of urolithiasis are urinary infection and urostasis. That we have been unable in a very large degree to reconcile this view with our clinical findings is evidenced by the fact that we continue to see day after day cases of advanced pyelitis of pregnancy confined to bed for weeks or months with various amounts of residual urine in the kidney pelves, but without the slightest tendency toward stone formation. We see cases of operative accidents to the ureter such as ureterovaginal fistulae of several years' duration with enormous quantities of residual and highly infected urine, but with no evidence of stone formation. Indeed, the incidence of pyelonephritis, vesical neck obstruction, vesical diverticula and various other urinary tract infections without stone formation, together with the fact that aseptic stones are quite common, is so overwhelming when compared with the relatively few cases of calculi seen complicating these conditions, that we begin to wonder if the proverbial cart is not before the horse. No one can doubt for a minute that these factors predispose to the formation of calculi. That they are themselves responsible for even a major role in the production of calculosis is debatable in the light of the recent dietary and physicochemical investigation. While groping in this comparative darkness, it is the duty of every clinician to report any case which offers the slightest possibility of a ray of light. The following case is presented in a baffled spirit of humility in the presence of a problem which, frankly, we do not understand.

Patient G. A. P., a white man, age 32, was injured in an automobile wreck March 31, 1932. He was brought to the hospital the morning of April 1 after 18 hours' exposure. The diagnosis of compression fracture of the first and second lumbar vertebrae was made and Buck's extension applied while the patient was being treated for shock. Twenty-four hours later he was put on a Bradford frame. There was no paralysis of the lower extremities and he voided normally. Routine urinalysis was negative. April 3 he developed lobar pneumonia from exposure and shock. His recovery was uneventful. April 26, a spine fusion operation was performed, using a graft 8x½ inches from the right tibia. Routine urinalysis was negative prior to this operation. April 30, the patient developed generalized aching and a temperature of 103°. His chest was normal. The urine contained numerous pus cells. A diagnosis of pyelitis was made and the patient was given oral medication. May 13, two weeks later, the urine contained 5 to 9 leukocytes to a low power field and his temperature was normal. May 26, a submucous resection was done. June 13, he experienced a sudden chill, fever and pain in the left side. The urine contained 4 plus pus. Cystoscopic and x-ray studies were made. Both kidney pelves were injected. X-ray of the kidneys, ureters and bladder was negative for stone. Bilateral pelvic lavage was done June 21 and June 28. July 3, he had pain in both kidney regions, chill, fever, and extreme nausea. The x-ray report was as follows:

"Re-examination of the kidney and bladder regions after injection of skiodan (particularly with reference to the left side) shows that the left kidney is very distinctly outlined and the pelvis and calices appear normal.

"The right kidney is slightly enlarged, but there is not much distortion of the pelvis and calices. The ureter is not distinctly outlined. Certainly the degree of enlargement of the left side hardly indicates gross damage to the kidney."

The roentgenologist was informed that skiodan had not been administered, and the following notation was then added to the report of July 3:

"We find that no skiodan has been injected and we also note that the films made in April, May and June are negative for calculi. The density seen in both of these kidneys conforms so closely to the outline of

*Read in Section on Urology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

the calices without obtunding of the tufts that we were positive that this case had been injected. If these are calculi filling the pelves and calices of both kidneys it is peculiar that the kidneys are not enlarged to any great extent."

July 16, the phenolsulphonephthalein test was equal on both sides. It was 7 per cent the first 15 minutes, with 36 per cent total in one hour. Nonprotein nitrogen was 30 mg. per 100 c. c. blood; and creatinine was 2 mg. per 100 c. c. of blood. X-ray findings July 29 were the same as on July 3. The patient was extremely anemic.

The next eight or ten weeks were occupied with attempts to increase the patient's general resistance and decrease his urinary infection.

September 30, the nonprotein nitrogen was 80 mg. per 100 c. c. of blood; the creatinine 6 mg.

October 3, the blood calcium was 12 mg. per 100 c. c. blood, and phosphorus 3.4 mg.

October 4, the nonprotein nitrogen was 62 mg. and creatinine 5 mg. Blood transfusion, forced fluids, and indwelling ureteral catheters were used as means of decreasing toxemia during the succeeding ten days.

October 14, the nonprotein nitrogen was 40 mg., the creatinine 2 mg.

October 18, the right ureter was blocked again. The nonprotein nitrogen was 106 mg., creatinine 5.3 mg. and the patient became more toxic than ever. It was decided to do a nephrotomy, as ureter catheter drainage was inadequate. Right nephrotomy was done October 22, preceded by blood transfusion. Two days following another transfusion was given. October 28, six days after removal of stones from and lumbar drainage of the right kidney, the nonprotein nitrogen was 48 mg. and creatinine 3 mg.

Pathological examination of the stones showed the following:

"The specimen consists of a mass of necrotic tissue and what appears to be exudate. In this material is incorporated a large amount of soft friable granular material which crumbles readily on slight pressure.

"Stones are present, which generally are soft, friable and crumble easily on pressure. They are evidently varied in their make-up. Calcium phosphate apparently is the chief constituent."

The patient was discharged from the hospital December 3 with moderate urine drainage from the lumbar incision.

December 13, chills, fever, and pain on both sides recurred and the patient re-entered the hospital. Examination of the wound revealed a plug of semi-solid, gritty material in the fistulous tract. When this was pulled away urine gushed out. Forceps were directed into the kidney pelvis through the fistulous tract and numerous pieces of this semi-solid substance were removed. Bilateral pelvic lavage was done and catheters were left in place at the same time. The catheters were changed December 20, 23, and January 7, 12, 16, and 23.

January 14, the nonprotein nitrogen was 40 mg. and creatinine 2 mg. per 100 c. c. of blood. Gram-negative bacilli and diplococci were observed in the urine.

February 2, the right kidney was blocked. Flat x-ray showed no stone shadows. Pyelograms showed a large mass occupying the pelvis of the kidney surrounded by opaque fluid. The nonprotein nitrogen was 50 mg. and creatinine 3.2 mg. per 100 c. c. blood.

The patient began to fail rapidly and renal blockage continued. Since we did not want him to sink to the inoperable state that existed before the first operation, it was decided to do a nephrotomy on the left kidney. He was transfused February 5 and operated upon February 7. He died of cardiac failure and surgical shock February 8.

To summarize the pertinent facts in this history: we have presented a case of extensive bilateral calculosis involving the pelves, calices and even the minor calices and developing as far as we are able to ascertain within a period of three or four weeks. The structural nature and consistency of these deposits were peculiar in that the phosphatic material was of a cheesy, meal-like consistency which could easily be molded between the fingers. These pouches of dough-like material were apparently encased in a pseudomembrane of considerable tenacity. Here and there a particle of the substance was found which resembled newly formed cartilage. However, a very elementary examination failed to reveal any structure characteristic of bone formation. The laboratory report was to the effect that the material consisted of calcium phosphate. It was not possible to differentiate between the primary and secondary formations. The particles removed from both kidneys were of the same consistency throughout.

These observations, together with the rapidity of growth, suggested to our minds the possibility that the kidneys or the protective mechanism in the urine had suddenly been overwhelmed. It was not like the more insidious process of stone growth by deposition of crystals on a primary nucleus. In searching through the literature we found that E. H. Paul, in a paper entitled "Bone Suppuration the Basic Cause of Renal Calculus in Twenty Cases Following War Wounds," called attention to the frequency of stone formation following suppurative fractures without paralysis. Jolly calls attention to two cases of bilateral stones following gunshot fracture of the femur, and one case of unilateral renal stone occurring in a patient in bed with a fractured pelvis. In the latter case the urine was sterile. In our own practice, we have seen three other cases of renal calculi, two of which were bilateral, following suppurative fractures.

We mention these observations to emphasize that the frequency of stone formation following fractures seemingly does not depend to any great extent upon bladder paralysis and ascending infections from the bladder as is commonly supposed. Stones following injuries to the spinal

column, however, are also quite common. Miller found postmortem bilateral renal calculi in eight of ten cases with fracture of the spinal column. With this information, we may say with reasonable security that there is some connection between the fracture itself and this particular type of stone formation which is not seen in other chronic diseases in which the patient is confined to bed over long periods of time, and that the paralytic factor does not seem to be of great importance. Our observations and the opinions obtained from the review of the literature certainly substantiate this belief. Jolly is of the opinion, however, that confinement in bed over a long period of time with resulting poor drainage from the kidneys is the principal predisposing factor. There are other diseases, such as pyelitis of pregnancy, pulmonary tuberculosis, typhoid fever and invalidism from various causes which confine the patients to bed for many weeks, in which the tendency to stone formation does not seem to exist.

In reviewing the possible factors underlying the connection between the fracture and calculi, we are immediately led to the subject of calcium metabolism. We realize that this is rather treacherous ground, new land, so to speak, which has not been thoroughly drained and cleared of debris. One might, from the present knowledge of calcium metabolism, mold into shape any one of several theories to suit one's individual inclinations, all of which would probably be wrong. We feel justified, however, in calling attention to a few salient points worthy of your consideration. We know that normal urine possesses a protective mechanism, supposedly the protective action of the colloids, which constantly prevents some of the constituents of the urine found in much larger amounts than could possibly be dissolved in the same quantity of water from agglutinating with consequent growth of the particles. A process quite similar is observed in the blood stream, the "citrate" effect here being largely influenced by parathyroid hormone. We diverge slightly from our subject to venture the hypothesis that the urine may also contain an unidentified hormone which normally exerts a citrate effect upon the urinary constituents.

Normally, about 90 per cent of the calcium taken into the body is excreted through the intestinal tract and only 10 per cent through the kidneys. The amount of urinary calcium excreted daily normally varies very markedly. Although the factors which determine the relative proportions excreted by the kidneys and the intestines are not fully understood, there are a number of normal variables and it is well known that the ratio may be easily reversed and the excretory process thrown largely upon the kidneys. Virchow was the first to use the term "metastatic calcification" to designate deposits of lime salts in various organs observed in conditions characterized by extensive destruction of bone such as osteomalacia, osteosarcoma, multiple myeloma, osteitis fibrosa diffusa, and so on. Metastatic calculosis occurs typically as a complication of hypercalcemia and as such is a common manifestation of experimental and clinical hyperparathyroidism and excessive vitamin D. The organs involved in these calcific deposits are almost exclusively those which excrete acid substances, the lungs, the kidneys and the fundus of the stomach, a process which renders the secreting cells correspondingly alkaline, as shown by Stieglitz. According to Cantarow,

> "It is probable that many instances of metastatic calcification previously considered of unknown etiology may be dependent upon an unrecognized state of hypercalcemia or hyperparathyroidism."

The case which we have presented had extensive bone destruction without suppuration. We believe that the severe degree of fracture, together with the removal of an 8-inch graft from the tibia associated with the extensive spine fusion operation, might have produced a temporary excess of urinary calcium, overwhelming in its effect; the attempt to demonstrate such a condition at the time being entirely neglected. Our one blood calcium determination, although the result was an extremely high normal, is of little importance, since no alterations in either serum calcium or phosphate may accompany the increased rate of elimination of these substances. We acknowledge our mistake in not having repeated urinary calcium estimations in this case, with the hope that we may stimulate such extremely competent workers in this field as Linwood Keyser, Charles Higgins and others to renewed activity. Metastatic calcification following large doses of parathyroid hormone have been observed repeatedly by Hueper. Under the same therapy, nephrolithiasis has been found in cases reported by Davies-Volley, Dereux, Schoenberger, Gergele, Hoffheinz, Barr, Bulger, Hunter and others.

Studies of mineral balance in osteitis fibrosa diffusa have demonstrated that the urine quite frequently contains 90 per cent of the calcium eliminated and there are reported cases in which

the amount eliminated by the kidneys reaches eight times the normal figure.

We are, at the present time, trying to collect data which may throw some light upon the question of urinary calcium output following major fractures. As far as we have been able to determine, this phase of the subject has never been investigated. Speed, who analyzed several hundred cases of major fractures, found that immediately after fracture the blood phosphorus is low and the blood calcium normal; within twenty-four hours after any major fracture the serum phosphorus rises, remaining very high for three to five weeks, then slowly returns to normal; and the serum calcium remains normal during this period. We have called attention to the fact that the serum calcium may be normal while the urinary calcium may be greatly increased. In fact, the serum calcium under such conditions may owe its normal state to a threshold point, the overflow in the urine following extensive fractures being sufficient to overwhelm the protective mechanism in the urine.

In the meantime, kidneys are being daily sacrificed upon an altar scarred by the knife which has hidden for so long our ignorance of a subject of sufficient importance to demand concerted effort toward its solution. There are members of this Association working from different points of view, but all acknowledging the leadership of Linwood Keyser, who ask for your cooperation in reporting cases and presenting all available information regarding the clinical and even hypothetical phases of this subject.

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DISCUSSION (*Abstract*)

*Dr. Linwood D. Keyser, Roanoke, Va.*—This excellent case report of Drs. Holmes and Coplan opens up for consideration a phase of calculosis which is little understood in spite of much experimental and clinical work which has been done in this field.

Experimentally we may recount the production of calculi in laboratory animals in the following ways:

(1) By the feeding of oxamide.

(2) By artificial excessive excretion of calcium oxalate.

(3) By excessive doses of parathormone.

(4) By excessive feeding of viosterol.

(5) The production of renal tubular calcification in bichloride poisoning and with obstruction of the renal artery.

(6) The formation of uratic calculi in animals with Eck fistulas.

(7) By feeding diets deficient in vitamin A.

(8) By infection of the urinary tract with *B. proteus ammoniae.*

(9) By infection of the urinary tract with streptococci.

(10) By the incrustation of organic or inorganic foreign bodies in the presence of infection.

The first six of these methods imply an aseptic metabolic disturbance. The mechanism of calculus formation with oxamide and calcium oxalate has been dealt with in numerous articles by myself and others. Apparently a synchronous deposition of urinary salts of atypical morphology and the coagulation or jelling of the urinary colloids to form the organic framework upon which the stone-forming crystals are deposited is at fault. By such a mechanism we can scientifically explain the production of aseptic calculi of urates, oxalates, cystin and crystalline phosphates and carbonates.

The deposition of calcium salts in the tissues is intimately involved with the calcium phosphorus metabolism. To consider this briefly we may say that variable statistical data has been derived from animal experiments with different investigators and with different species. Speed has shown that fresh fractures of bone are associated with a rise in serum phosphates and an excessive urinary excretion of calcium. Again metabolic perversions brought about by hyperparathyroidism or excessive viosterol intake may shift the excess of calcium elimination from the alimentary tract to the urinary tract. Calculi of minute type have been noted under such conditions. Again the deposition of lime salts in necrobiotic tissue is explained in a variable and highly unsatisfactory manner. Klotz teaches that such deposits occur from hydrolysis of fats which precipitate calcium soaps and these consequently are acted upon by carbonic acid to form calcium carbonate. Howland states that when the carbon dioxide tension of the blood is low, calcium is precipitated from the serum. Again, Rable attributes the process to a disturbance of acid-base equilibrium in the blood, while Fell and Robinson introduce a ferment, enterase-phosphatase, as the factor which promotes precipitation of lime salts. Increased ingestion and absorption of phosphorus and magnesium diminish the exogenous absorption of calcium, deplete the normal body depots of lime and increase the urinary calcium. Renal calcification in bichloride poisoning, in obstruction of the renal artery and in tuberculosis, as well as the lime deposits in the bladder in alkaline encrusted cystitis, are noteworthy. Ewell recently reported a renal calculus weighing 582 gm. in a patient with calcified thyroid, a large gallstone and calcified uterine fibroid. The case of ossification of the kidney with stones reported by Phemister, Hellstroem, Sacerdotti and Fratin and by Higgins are noteworthy in this possible relationship of calcific changes to stone formation. On the other hand, calcinosis universalis such as has been described by Hein may show no predilection to urinary stone.

The mechanism of infectious calculosis associated with urea-splitting alkali-producing infections has not been worked out. Such infections produce amorphous ammonium magnesium phosphate and calcium carbonate stones as a rule.

At the Chicago meeting of the American Urological Association, I reported the production of calculosis in rabbits with a streptococcus from a stone-forming patient. Studies still in progress tend to show that the process here is one of calcification in necrobiotic tissue. In other words, the first lesion is an ulcerative one with epithelial destruction. In the early stage of the process

incrustation or infiltration of the necrotic ulcer tissue with lime salts takes place.

From this we may possibly infer that infectious calculosis does not follow the crystalline morphologic change and the relationship to the colloids of the urine such as has been demonstrated in aseptic calculus formation.

Methods of preventing rapidly forming and recurrent calculi seem to depend chiefly upon shifting the hydrogen ion concentration of the urine and the elimination of infection by establishing better urinary tract drainage. Vitamin and dietary control seem secondary factors in importance and difficult to evaluate: except probably in uratic stones. The solution of calculi *in situ* is an ideal to which man has striven for centuries. This may be impossible of achievement, but, on the other hand, it may not. I have seen one stone diminish rapidly in size with the administration of dilute nitro-hydrochloric acid by mouth. At present lavage with phosphoric acid is in vogue and possibly in minute calculi and certainly in vesical incrustation it may be of value.

I am personally interested in the possibilities afforded by certain organic acids, especially malic, citric, and tartaric acids. Malic acid is apparently innocuous and is excreted from 20 to 40 per cent unchanged in the urine when given orally in large doses. The urine of one of my patients taking 10 to 16 grams of malic acid daily tends to dissolve phosphatic stone in the test tube. In another patient seen recently I possibly reduced the size of a small stone by feeding malic acid in large doses and lavaging the renal pelvis with a 1 per cent solution of the same drug. Malic acid seems less irritating than the same strength of phosphoric acid. This stone, which had been present probably two years, passed after this regimen with the ureteral dilatation afforded by two No. 5 F. catheters. Further work with this and similar drugs is planned. At the present let me emphasize that I make no claim for the procedure, but I wish to cite these cases as matters of record.

From this background we may realize the magnitude of the problem of lithiasis following spine fracture which the case of Drs. Holmes and Coplan presents. Several infectious factors in this patient are apparent: first the pneumonia; and second, the pyelonephritis. The possibility of a metabolic change with excessive calcium excretion, the possibility of a fibrinogenuria must be borne in mind. Until we can follow with more scientific accuracy the metabolic factors in such cases, we are forced to purely hypothetical reasoning, and I am hesitant to speak dogmatically as to etiology. My feeling is, however, that we must attempt to explain these cases tentatively on the basis of infection.

Drs. Holmes and Coplan are to be commended in their plea for more cooperation among urologists in studying the biochemical and bacteriological aspects of patients who are in the active clinical phase of stone formation. We know something of urolithiasis now which we did not know ten or twelve years ago. However, when we come to deal with individual cases, our ignorance is as yet tremendous. The active stone former, especially the patient with rapidly recurrent calculus, is a challenge to each of us. My prediction is that another ten years will bring new light on the whole subject. Even the solution of stone *in situ* may cease to be an alchemist's dream and become a matter of practical reality. Is this, after all, too much to hope for?

*Dr. Benj. S. Abeshouse, Baltimore, Md.*—The subject of renal calculi in the various bone diseases, particularly following vertebral and cord injuries, is an extremely interesting one. During the past four years Dr. Goldstein and I have made a comprehensive review of the subject and our observations are reported in an article now in press.

The earliest reference to the formation of renal calculi following vertebral and spinal cord injury is a case observed at autopsy and reported by Bastion in 1861. The relation of vertebral and cord injuries to stone formation was first pointed out by Bramann in 1891. In 1895, Mueller reported eight cases of bilateral nephrolithiasis occurring in a series of ten cases of severe injuries of the spinal column. Other early case reports of urinary lithiasis following such injuries are by Lediard in 1875, Smith, 1882, and Puzey, 1885. Further important contributions to this subject by continental observers have been made by Kocher (1896), Weber (1897), Wagner and Stolper (1898), Seelfisch (1908), Caspar (1910), Hollander (1919), Simon (1927), and others. Individual case reports by American observers have been recorded by Cabot (1918), Eisendrath (1927), Cahill (1928), Young (1928), O'Conner (1928), and Harper (1930). During the World War, Benda observed a number of cases of extensive bilateral calculus formation in a series of fifty autopsies on soldiers dying of gunshot wounds of the spinal cord.

The length of time required for the formation of renal calculi following such injuries is variable, but usually four to six months elapse before symptoms of renal colic are manifested. Quite frequently the presence of urinary lithiasis is unsuspected and the diagnosis is made from roentgenographic findings during further studies of the bone injury. O'Conner reported a case of renal and vesical calculi occurring four weeks after the vertebral injury. Seelfisch's patient developed renal colic eight weeks after the spinal injury and the diagnosis was confirmed by x-ray.

There are many factors concerned in the formation of renal calculi following vertebral and cord injuries. The following conditions have been considered as probable etiological factors concerned in the formation of renal calculi in these cases, namely: (1) injury to the kidney; (2) ascending cysto-pyelitis resulting from injury and infection of the urinary tract; (3) postural and metabolic disturbances following fracture; (4) paralysis of the cord with its effect upon renal secretion. The most important consideration is the condition of the kidneys before and after the accident. The existence of an upper urinary tract lesion antedating the spinal injury must always be borne in mind and carefully excluded as a causative factor.

In many cases there occurs at the time of the vertebral injury a primary intrinsic lesion of the kidney, that is, a rupture with extravasation of blood, which is responsible for subsequent stone formation. (This view is supported by Mueller, Weber, Caspar and others.) Caspar has shown that blood clots and new connective tissue may form in the renal pelvis or parenchyma as a result of trauma and serve as a nucleus for stone formation. The type of stone usually encountered in these cases is an oxalate or urate stone which forms according to the colloidal precipitation theory.

Secondary or extrinsic lesions of the kidney following spinal injuries are the result of a paralysis of the bladder, ureter or renal pelvis. (Hollander maintains that following cord injuries there is an interruption of the reflex arc concerned in the expression of urine from the renal papillae into the renal pelvis, together with a loss of muscular activity in the bladder, ureter, and pelvis.) This derangement of the muscular and nervous mechanism of upper urinary tract favors urinary stagnation and infection with a resulting cystopyelitis or pyelonephritis. Secondary changes in the urine soon occur, namely: decomposition and ammoniacal fermentation of urinary salts, with the ultimate formation of phosphatic calculi.

The presence of calcium stones following vertebral and cord injuries has been attributed to the absorption of calcium from the surfaces of the fractured vertebrae and from the long bones of the extremities as manifested by the high degree of bone atrophy in these cases. The long immobilization of the body following fractures of the spine would favor such absorption as pointed out by Kocher, DePoutre, and Schwartz.

Several observers have attempted to explain the renal lithiasis following vertebral fracture on the basis of trauma or contusion of the spinal cord. (Wagner and Stolper maintained that contusion of the spinal cord resulted in a vasomotor paralysis and thus indirectly in a collateral anemia of the kidneys which in turn led to a marked epithelial desquamation). They also pointed out that traumatic injury to the cord may result in a motor paralysis of the bladder which in turn causes cystitis. The alkalinity of the urine accompanying such an infection favored stone formation. The dead parenchymal cells which remained acted as nuclei for the calculi.

The true significance of the tendency to calcium deposits after vertebral fractures as a result of the deposition of calcium salts remains, as yet, unexplained, although various theories have been offered. In this connection H. Taterka stated that an injury to the secretory fibers of the vegetative (sympathetic) nervous system supplying the kidneys plays an important role. He maintained that an absence of neurotrophic influence upon the kidney hastens calculus formation as a result of certain qualitative urinary changes. Important contributions to the subject of elimination of calcium through the kidney and its deposition in kidney pelvis or parenchyma have recently been made by Hess and his associates. They found that following division of the sympathetic or parasympathetic nerves there ensued a marked disturbance in the equilibrium of both calcium and phosphorus in the blood serum. They also observed a rise in the calcium content of the blood serum following cutting of the vagus nerve and a definite fall in the serum calcium following division of a splanchnic nerve or of the celiac plexus.

For all practical purposes it appears that the type of stone developing after vertebral fractures depends upon the subsequent crystalloid content of the urine as secreted by the non-injured or injured kidney. Zondek states that the stone seen after such injuries is always particularly rough and irregular. He suggests that when such shadows are found in a roentgenogram of the kidney, the possibility of an antecedent spinal injury should be ruled out

## ARTIFICIAL PNEUMOTHORAX IN THE TREATMENT OF PNEUMONIA*

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The theory of Coryllos and Birnbaum,[1] well supported by experimental work and clinical observations, represents lobar pneumonia as a bronchiogenic, pneumococcic, lobar atelectasis of the lung due to obstruction of a central bronchus with atelectasis proceeding from periphery to center, as a natural consequence of the absorption of the alveolar air, followed by prompt extension of the pneumococcic cellulitis from the point of bronchial occlusion to the periphery.

Though this theory may be questioned, we must admit it promises a solution for some of the enigmatic features of this disease which have puzzled the most skilled clinicians in the past. For instance, the occasional absence of breath sounds or the presence of diminished breath sounds in the early stages of pneumonia, with the subsequent development of tubular breathing, may be satisfactorily explained by the initial atelectasis which would eliminate or inhibit breath sounds, later to be followed by consolidation (cellulitis), extending from the point of bronchial occlusion to the periphery, giving rise to the physical conditions necessary to convey the tubular breath sounds to the surface. Likewise the x-ray examinations in the early stages of pneumonia often reveal an opacity at the periphery with an intervening gap adjacent to the hilum which is subsequently filled in by the opacity extending from the hilum toward the periphery.

The studies of postoperative pneumonia[2] suggest that x-ray evidence may be observed before clinical signs appear. The atelectasis which promptly follows the bronchial obstruction and first appears at the periphery may account for the early peripheral x-ray shadows, and the subsequent closure of the proximal gap may be explained by the extension of the cellulitis and the inflammatory exudate from the point of occlusion in the central bronchus toward the periphery.

Scott and Cutler[3] have definitely determined that the inhalation of carbon dioxide after operations will virtually eliminate the danger of massive collapse and the associated pneumonia.

*Received for publication January 11, 1934.
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The observations of Henderson[4] and his associates on the "Treatment of Pneumonia by the Inhalation of Carbon Dioxide" apparently corroborate the above and lend additional support to the theory of Coryllos and Birnbaum. Further corroborative evidence is found in the fact that when Henderson and Haggard[5] administered oxygen and carbon dioxide in the treatment of carbon monoxide asphyxia they discovered that this procedure greatly reduced the incidence of post-asphyxial pneumonia. Additional collateral evidence in favor of the theory of Coryllos and Birnbaum is to be found in the fact that Osler and McCrea[6] observed that the diagnosis of massive collapse of the lung after operation or injury "may be difficult, especially from lobar pneumonia," and that J. P. Crozer Griffith[7] refers to the difficulty of differentiating atelectasis and pneumonia. Griffith,[8] in reporting forty cases of pneumonia, found the heart displaced toward the affected side in sixteen. While he did not consider this as definite evidence of atelectasis, it would seem to take on a new significance in the light of our present knowledge. Thoenes[9] and Wallgren,[10] making independent observations, have reported the association of atelectasis and pneumonia with displacement of the heart toward the affected side.

If we accept the theory of Coryllos and Birnbaum and at the same time if we bear in mind the mechanical factors involved in massive atelectasis,[11] it seems that we may justly look forward to a more radical and more effective therapy in the management of pneumonia.

If atelectasis is present during the course of pneumonia, it may readily explain much of the respiratory distress and the occasional intrathoracic pain not due to pleurisy. The mechanical factors involved in massive atelectasis constitute a direct indication for artificial pneumothorax.[11]

Though we wholly disregard the above theory, we still have many reasons for the employment of artificial pneumothorax in the treatment of pneumonia. For a number of years the author, influenced by experience in the collapse therapy of pulmonary tuberculosis, pulmonary abscess and bronchiectasis, has contemplated the advisability of artificial pneumothorax in the treatment of pneumonia. This conception originated in the fact that rest seemed to be the one proven and universally accepted therapeutic agent in the treatment of this disease. Since the history of rest in the treatment of pulmonary tuberculosis paralleled that of pneumonia, until Forlinini conceived the idea of local rest through artificial pneumothorax, it was thought that local rest might accomplish similar results in pneumonia.

The hope of preventing or relieving painful pleurisy and harassing cough constituted an additional appeal. In this connection it also seemed possible to limit the spread of the inflammatory process through contiguity of tissue and to decrease the incidence of empyema by interposing a cushion of air between the two pleural surfaces, thus intercepting the constant agitation and friction which must result in aggravation and undue dissemination of the infection.

When we consider the nature of the infection, the structure of the lungs, and the influence of gravity plus the possible peripheral suction due to atelectasis, does it not seem reasonable to believe that by means of collapse therapy secretions and inflammatory exudate may be expressed and their progress toward the periphery retarded; the absorption of toxins lessened, probably through diminished flow of blood and lymph; pleuritic friction and pain inhibited, and rest, both local and general, greatly favored?

With these considerations in mind, certain members of the medical staff of the University Hospital during the winter of 1929-30 were requested to cooperate by referring suitable cases for trial. The few cases available on the service during this season proved to be very atypical and were considered unsuitable for such a venture. However, in the early part of 1930 two clinically unfavorable cases were seen in private practice. Both of these cases were considered hopeless by the attending physician at the time consultation was requested, but both were sorely tried by pleurisy pains and were constantly begging for relief. This alone was considered a justifiable indication for pneumothorax. In one, the heart was thought to be slightly displaced toward the affected side, suggesting an associated massive atelectasis which, in our opinion, further justified a trial of pneumothorax.

*Case 1.*—T. H. was a man of 23. The past history is unimportant except for the excessive use of alcohol. The present illness was initiated by a chill and pain in the left chest. There was a prompt rise in temperature, followed by cough and bloody sputum. The course of the disease seemed to be progressively unfavorable. On the fifth day examination revealed the physical signs of complete consolidation of the lower lobe of the left lung and marked impairment of resonance in the upper lobe. There was also an audible pleural rub near the left border of the heart and a pleuropericardial sound which was louder with inspiration, but did not disappear at any time during the respiratory cycle.

Examination of the right lung suggested partial consolidation in the lower lobe.

The patient was very toxic and at times delirious, but he complained almost constantly of pain in the left side. Among other therapeutic measures pneumothorax was discussed, and while it was agreed that the patient had little, if any, chance for recovery, the attending physician acquiesced in a plan to employ pneumothorax, mainly for the purpose of separating the pleural surfaces in order to relieve the constant pain which was apparently greatly aggravated by cough. The slight displacement of the heart toward the left was also considered an indication for collapse therapy as atelectasis was suspected.

Under local anesthesia (0.5 per cent novocain) on April 6, 1930, the initial pneumothorax needle was introduced between the fifth and sixth ribs in the left axilla without moving or disturbing the patient. The pleural space was found without difficulty and the manometer registered minus one, minus three. This was rather surprising, as the pressure is usually much more negative. However, in this case it was thought that the pleural pain limiting the respiratory excursion and the consolidation of the lung would tend to overcome the negative pressure and limit the manometer fluctuations. The feasibility of this assumption was proven by the fact that after the introduction of a small amount of air the manometer fluctuations were greater and the negative pressure more noticeable, no doubt because pain was relieved and breathing more natural. Three hundred c. c. of air were introduced and the closing pressure was zero minus three. The patient was promptly relieved of the pleurisy pain, which did not return. Respiration was deeper and cough was less distressing. Examination elicited a tympanitic percussion note where absolute dullness existed immediately before the treatment, the pleural friction disappeared and the pleuropericardial sound was no longer audible. It was impossible to make out any change in the position or the behavior of the heart and there was no demonstrable change in the pulse.

In spite of the fact that the patient seemed to be much more comfortable, he died eighteen hours later, apparently as a result of the overwhelming toxemia which was present before pneumothorax was instituted.

*Case 2.*—R. F. M. was a man of 48. The family and personal history were negative except for the fact that he was a heavy drinker. The onset of the present illness was sudden with chill and high fever and blood tinged sputum, fever persistently high from the time of onset, and severe persistent pleurisy pain on the left beginning forty-eight hours after the onset. The patient constantly complained of pain, which became very distressing with cough.

This case, first seen on the sixth day after onset, presented all the classical signs of lobar pneumonia with complete consolidation of the left lung. It was impossible to elicit pleural friction, although the patient was insistent in his plea for something to relieve the pain in his left chest. The heart was apparently in its normal position. The patient was obviously very ill, respiration and pulse were quite rapid and the heart sounds weak and distant, especially the second pulmonic. In spite of his serious condition, it was agreed that artificial pneumothorax might be tried with at least some promise of relieving the severe pain. With the same technic employed in *Case 1*, 350 c. c. of air were introduced into the left pleural space on April 19, 1930. The manometer readings were just about the same as recorded in *Case 1*. There was no evidence of pain or shock as a result of the treatment and the patient experienced prompt relief from the pleurisy pain and his respiration seemed easier and less shallow. A tympanitic percussion note replaced absolute dullness. There was no return of the severe pain and the patient was grateful for the relief experienced, but about twelve hours later he died from what appeared to be failure of the heart muscle.

## DISCUSSION

An attempt was made at this time to establish certain indications for the employment of artificial pneumothorax in the treatment of pneumonia.

The suggestion that it be given a trial was based chiefly upon these indications and not upon the mere fact that it had been tried in two apparently hopeless cases. However, attention is called to the fact that one of the indications was fully met in each of these cases, namely: the relief of pleurisy pain. It is also noteworthy that no demonstrable untoward results followed the treatment and that its administration occasioned no anxiety or discomfort.

It was recommended at the time that these patients were treated (early part of 1930) that this procedure be given a trial in well selected cases, but that it be attempted only by those who had had wide experience in the general use of artificial pneumothorax. This is particularly important until the merits of the method are determined and its limitations established.

Pneumothorax, we concluded, was more clearly indicated in the early stages of pneumonia, but might be employed to meet certain indications at any time during the course of the disease. A report of the above cases with a discussion of the indications for pneumothorax and our conclusions as to its probable value was submitted to the *Archives of Internal Medicine* for publication October 11, 1930, but was not accepted at that time. Considerable interest has been shown in the subject in more recent literature.

In the *Lancet*, January 2, 1932, J. J. Coghlan[12] reports six cases of acute lobar pneumonia treated by artificial pneumothorax. The first case treated was admitted to the hospital June 21, 1931. The author makes the following brief statement with reference to theory and rationale:

"The induction of artificial pneumothorax on the affected side, according to the technic described, has the

advantage that it (1) separates the inflamed pleural surfaces, relieves pain, and allows of easy respiration; (2) puts the inflamed lung at rest; and (3) limits the flow of blood through the pneumonic lung, thereby diminishing anoxemia, and interfering with the passage of toxins into the general circulation."

H. G. Anderson,[13] in a paper read at a clinical meeting of the College of Medicine and Dentistry, West China Union University, June 3, 1932, reported six cases of lobar pneumonia successfully treated by means of artificial pneumothorax.

In the same Chinese medical journal, K. H. Li,[14] Soochow Hospital, Soochow, reported six cases similarly treated with one death. In the *Lancet*, October 1, 1932, Viswanathan,[15] General Hospital, Madras, reported having employed this form of treatment in seven cases with one death.

Perlroth and Topercer[16] report seven cases treated with one death in an alcoholic aged 55, who also had aortic atheroma.

Of the twenty-nine cases reported, there were twenty-four males and five females. The right side was affected in thirteen, the left in nine; the location of the disease was not determined in seven. Pleural pain was reported in twelve cases and relief of pain upon the initial filling in twelve cases. In one case there was pleural effusion. The time of initial filling after the onset of disease varied from the third to the ninth day. The number of fillings varied from one to three; the amount of air from 80 to 750 c. c. Twenty-six patients recovered and three died. It was the consensus of opinion that all symptoms were favorably influenced and the crisis hastened. The author's two cases make a total of thirty-one patients treated by pneumothorax, with five deaths.

With one exception, those reporting cases have, in the main, accepted the indications suggested by Coghlan and they have, with slight departures, followed his technic.

Perlroth and Topercer say that the English authors consider pneumonia a local disease and accordingly base the results of treatment upon local effects; whereas, they consider pneumonia a general or systemic condition and attribute the beneficial results of pneumothorax to a vague pleural reaction or something equivalent to "activation of the cellular protoplasm" and "mobilization of the antibodies" resulting in an increase in the defensive factors. In other words, pneumothorax is a general therapeutic measure for a general infection. They also arbitrarily state that the treatment should be employed only in the first five days.

Perlroth and Topercer also consider pleurisy in the course of pneumonia a contraindication, stating that adhesions might interfere and that secondary infection would be almost inevitable. In the author's opinion, the beneficial affects of artificial pneumothorax in pneumonia are both local and systemic and the presence of pleurisy constitutes a definite indication for its employment. He is also of the opinion that induction of pneumothorax early in the course of the disease is most desirable, but that there should be no time limit for the institution of treatment.

The amount of air introduced at any one time should depend upon the clinical condition of the patient and the intrathoracic phenomena apparent at the time. Experience with pneumothorax in other conditions would suggest that the initial filling should not exceed 300 c. c. and that the frequency of refills and the amount of air given should be governed by the needs of the individual case.

Promiscuous and ill-advised induction of artificial pneumothorax in the treatment of pneumonia will bring the method into disrepute. Even so-called "intuitive sagacity" cannot take the place of experience in guiding the operator safely through the important and often puzzling variations in the phenomena arising in the course of artificial pneumothorax.

This method of treatment during the uncertain period of testing should be attempted only by those who have had experience in the collapse therapy of other pulmonary conditions. Only the experienced operator is fully qualified to appraise the intrathoracic phenomena for guidance in each individual case. Such an appraisal is essential if serious hazards are to be avoided and the fullest possible benefits achieved.

After a review of the subsequent literature, it seems unnecessary to alter the conclusions which we reached in 1930.

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## THE QUANTITATIVE DETERMINATION OF WATER LOSSES IN SURGICAL PATIENTS*

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It is generally recognized that fluids are important to the surgical patient. Many papers have been written during the past few years dealing with the kind of fluid to be given and with methods for giving fluids. The healthy person maintains his water balance by responding to hunger and thirst. The sick patient, because of his disease or because of an operation, cannot respond to these and his fluid intake is governed by the surgeon. We were impressed with our inability to determine with any degree of accuracy and assurance the amount of fluid to be given to any particular patient. As a result of our dissatisfaction with the empirical determination of fluid requirements, we have made quantitative studies of fluid losses of surgical patients under various conditions.

Without entering into a complete discussion of water metabolism, it can be stated briefly that there are, generally speaking, two main sources of available water to the organism and three means of water excretion. These can be listed as follows:

| *Available Water* | *Excreted Water* |
|---|---|
| (1) Fluids drunk | (1) Water of urine |
| (2) Food, diet or body tissue | (2) Water of stool |
| (a) Water content | (3) Water vapor |
| (b) Water of oxidation | |

Fluids drunk vary with conditions of work, heat, and humidity. The water available from food comprises 90 per cent of the weight of the food, including water content and water produced by the oxidation of foodstuffs. In this manner the ordinary house diet furnishes 1,200 to 1,500 c. c. of water a day. During undernutrition body tissue is utilized for food. In starvation the freeing of between 400 and 500 c. c. of water is possible as a result of freeing water of the tissues and of oxidation of the body tissues.

Water is excreted as urine in amounts that vary with the fluid intake and with the losses from other channels. Water is lost from the stool in small amounts averaging about 150 c. c. daily. With diarrhea, vomiting and from intestinal fistulae, water losses from the gastrointestinal tract may be very high. The third normal path of excretion of water is through the skin and lungs. Water is vaporized continuously from the skin and lungs under all conditions. Water loss from the skin is an important part of the mechanism for the regulation of body temperature. At a comfortable environmental temperature about 24 per cent of the body heat is dissipated by vaporization of water without visible sweating. Under these circumstances the water vaporized amounts to from 800 to 1,500 c. c. daily. With a rise of environmental temperature, the heat dissipated by the vaporization of water increases until it may account for 100 per cent of the total heat dispersed. The process may then require several liters of water daily. The water used in this manner has preferential rights: that is, the body will vaporize water to control body temperature at the expense of water for the formation of urine.

A more detailed description of the above processes is given in other publications on this subject.[1 2 3 4 5]

We first studied water losses during the time of operation and during a four hour recovery period following operation. The essential finding was a total fluid loss by blood, vomitus, urine and vaporization averaging about one liter during this period. Water vaporized comprised 70 per cent of the total. Two groups of patients were then observed under different conditions of coverings. In the first group, patients were covered with a blanket and surgical drapes in the operating room and were placed in the "ether bed" with four blankets as coverings. A second group were covered only with surgical drapes and a folded blanket across the chest in the operating room and were covered with two blankets during the recovery period. The pa-

*Read in Section on Surgery, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

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tients with the lighter covering lost appreciably less water by vaporization with a resulting increase in the urine volume and they were infinitely more comfortable. We feel that it is much better for the unconscious patient to have the same amount of covering that he would choose of his own volition. The old-fashioned ether bed causes the loss of water that would be more valuable to the patient if used for other physiological processes.

The investigation of water loss was continued to a study of the water exchange of surgical patients over several days' time and with a variety of surgical lesions. The first observations were made on simple surgical cases otherwise in good health subjected to short operations, one an inguinal hernia, the other a parotid fistula. The water lost by vaporization during three days approximated the amounts lost by normal individuals at rest: that is, from 1,000 to 1,500 c. c. The intake was smaller than normal on the day of operation due to nausea and the water lost by vaporization was somewhat increased, the lessened intake being reflected in the small urinary output. On the day following operations, the patients drink much larger amounts of fluid than normal and quickly restore the water balance.

The next patient studied was a male of eleven years with general peritonitis secondary to acute appendicitis of three days' duration. He was treated by the Ochsner method without operation. During the ten days of study he had nothing by mouth; all the fluids given were administered by the intravenous method. He improved steadily, becoming afebrile on the tenth day. His daily loss of water by vaporization was over 1,000 c. c. the first day and with the recession of the infection the amount of fluid lost in this manner decreased steadily until it was only 742 c. c. on the first afebrile day.

One can estimate roughly that the amounts of water lost thus by vaporization in an adult with a similar lesion would be about twice as large, that is, about a two-liter loss a day during the acute phase of the disease, decreasing gradually to about 1,500 c. c. at its termination. Each day he was given over three liters of fluid intravenously, which covered his losses of water from all sources and gave him about two liters of urine per day of a low specific gravity.

Another study was made on a male of seventeen years with chronic osteomyelitis of the tibia and an acute purulent arthritis of the knee joint. A disarticulation of the knee was performed the day following the period of study and his general condition improved steadily as his temperature fell from 103.8° to normal twelve days later. The water lost by vaporization steadily decreased with his general improvement from over two liters to 1,340 c. c. during this period. These losses would have been somewhat higher if he had been an adult.

Another patient with a severe infection was observed for a period of sixteen days. He was a man, aged thirty, with a pulmonary abscess which was drained at the midpoint of the period of observation. The water lost by vaporization was higher in this patient than in any other observed, varying from 2,719 c. c. to 1,672 c. c. as he improved and his fever lessened.

Three patients with hyperthyroidism were then studied. Since there is an increased heat production associated with this condition, there must be a compensatory heat loss and one would suppose that the water lost by vaporization would be greater than normal.

All of these patients showed a loss of water by vaporization that averaged about 1,800 c. c. per day under the usual conditions of bed rest and routine treatment for the disease. If we compare the insensible loss in patients with hyperthyroidism with the patients operated upon for hernia, in both instances a short operation with about the same amount of trauma, we find the insensible loss has increased 80 per cent in the instance of the patients with hyperthyroidism. Due to the increased heat production from the increased metabolism and the fever, greater quantities of water were used in the dissipation of heat by evaporation.

We have tried to emphasize that while the normal person at rest or light activity loses from 800 to 1,500 c. c. of water by vaporization from the skin and lungs, the surgical patient with infection, fever, hyperthyroidism and with the abnormally warm environment will lose from this source an average of about two liters a day. In order to show how the water lost by vaporization varies with the environmental temperature, this insensible water loss was studied in two patients at 76° F. and again at 83° F. One of the patients had a mild hyperthyroidism with a basal metabolic rate of +32. This patient lost 1,157 grams of water per day in an environment of 76° F. and lost 1,992 grams per day in an environment of 83° F. The other subject with a basal metabolic rate of +8 lost 1,068 grams per day of water at 76° F. and lost 1,536 grams of water per day in an environment of 83° F. These figures, together with our observation on the greater water losses associated with heavy blanket coverings, make it clear that some water can be saved to the patient if we will keep our surgical patients in

comfortable room temperatures and with comfortable bed covering. In computing the daily water needs of any sick surgical patient we can accept the figure of 2,000 c. c. of water lost daily by vaporization as a sufficiently safe estimate for all practical purposes. All other fluid losses by diarrhea, vomiting, from intestinal and biliary fistulae and by wound drainage can be measured. If the amount of fluid lost from these sources be added to the constant of 2,000 c. c., we have the amount of fluid the body requires exclusive of the urine. One can then estimate the amount of urine desired and add this figure to the one already obtained and the sum will be the amount of fluid required by that patient for a 24-hour period.

The importance of considering water losses in a quantitative manner becomes clear when one encounters patients who become dehydrated in the face of the administration of what has seemed an adequate amount of fluids. If the body loses water to the extent of a tenth of its weight, anuria will occur. The daily loss to the body as represented by greater daily output over intake is cumulative and the daily urinary output will diminish until anuria occurs. We have seen several of these cases and a simple calculation of the water losses over the preceding days compared to the intake has always shown the amount of fluid intake to be less than the body needs; that is, if the surgeon did not take into account some important source of water loss and give fluids according to some empirical rule. We have also seen anuria induced by the administration of strong hypertonic solutions such as 50 per cent glucose solution in large amounts. These solutions abstract water from the body, increase the amount of urine temporarily, but eventually cause dehydration and perhaps anuria.

The kidney functions with the water available after other physiological processes have been provided for. It is advisable to know the function of the kidney before estimating the amount of urine desired. If fluid is restricted, the urine arrives at a point where the greatest possible concentration of solids is carried. The normal individual excretes 35 to 50 grams of solids per day and 14 grams of water are required to carry each gram of solid with the normal kidney working at maximal concentration. If the patient does not get this amount of water, retention of waste products occurs. About 600 c. c. of urine is, then, the minimal amount for the normal individual. In patients with kidney disease, the kidneys cannot concentrate urine in a normal manner and as high as 40 grams of water may be necessary to carry away each gram of solids, in which instance about 1,600 c. c. of urine would be necessary to prevent retention of solids. In every instance when the function of the kidneys is in doubt, a concentration test should be carried out. In short, the surgeon must determine the amount of urine desirable for any given case from his knowledge of the patient. If the kidneys are normal, we feel that an adequate water intake to carry on the normal physiological activities of the body is one that provides for two liters of insensible loss, covers losses from the gastro-intestinal tract and furnishes at least 1,500 c. c. of urine with specific gravity of not more than 1.015.

In conditions of dehydration it must be borne in mind that when the body loses some of its own water it has also been deprived of some of its minerals. Water lost insensibly from the skin and lungs carries negligible quantities of minerals. Profuse sweating will carry away some sodium chloride, the loss of which may in time be important. Ordinarily this water loss may be replaced by an isotonic glucose solution. Water lost from the gastro-intestinal tract must be replaced by saline solutions.

It is not inferred that the usual surgical patient does not get enough fluids. Clinical experience has shown that patients usually do well with fluid intakes given on clinical indications alone. We do not believe that harm is done by giving larger amounts of fluid than are necessary to maintain water balance, but if excesses are given it adds to the discomfort of the patient and interferes with his rest. We offer a constant to cover certain water losses that have seldom been taken into account, and by our analysis of water losses from various sources offer the surgeon an opportunity to compute and give fluids in amounts that approximate rather accurately the patient's physiological needs.

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# SOME HEART IRREGULARITIES AND THEIR MANAGEMENT*

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This subject was selected as one which interests the general practitioner. I have availed myself freely of the writings of those whom I consider best versed on the subject and have tried to collect the data in a simple and comprehensive way. The paper contains few original opinions. I am going to disregard quotation marks and make few direct references to authors.

I shall deal principally with observations at the bedside or in office work, although I thoroughly appreciate the fact that there are many cardiac irregularities that can be diagnosed accurately only by the use of the electrocardiogram. When we, as practitioners of medicine in general work, discover an irregular heart, we have to use our diagnostic knowledge to the best of our ability.

The main causes of cardiac irregularities may be divided into three anatomical groups:

(1) Those that affect the auricle;

(2) Those that affect the auriculoventricular node and bundle; and

(3) Those that affect the ventricle.

The irregularities affecting the auricle arise in the normal pacemaker, the sino-auricular node, or as an abnormal rhythm developing outside the node. These different irregularities may be single or they may occur each in its own manner as a succession of abnormal beats when one rapid beat follows another. When the irregularities occur singly they are referred to as premature contractions or extra systoles. They may be ventricular, auricular or nodal. They can be differentiated absolutely by instrumental means, but this is not important clinically. They are extremely common and almost everyone past middle life has probably had them at some time. We, however, must not lose sight of the fact that they occur in well recognized cardiovascular disease as well as in the apparently normal heart. They may be precipitated or aggravated, especially in those accustomed to the use of tobacco, tea and coffee. They are rare indeed where the heart rate is 100 and practically unknown when the rate exceeds 120. Exercise, increasing the heart rate, will abolish this form of irregularity, but as the heart slows the irregularities are prone to return. They may be present when the patient stands and may disappear when he lies down.

When a single premature beat interrupts the regular rhythm, an early cardiac pulsation will be recognized at the apex with two extra sounds. If the aortic valve is open a weak premature arterial pulse will be detected. If the premature beat is too weak to affect the arterial circulation, there will be an intermission at the wrist with one extra sound at the apex.

The bigeminal, trigeminal and quadrigeminal pulse is usually due to a premature beat which takes place at each second, third and fourth beat of a rhythmic series.

Premature beats or extra systoles are of importance only as possibly indicative of the character of other more serious and prolonged paroxysms of tachycardia. These paroxysms may begin with explosive suddeness and stop with an equally sudden impression on the patient. This distinctive type of auricular disturbance is commonly known as paroxysmal auricular tachycardia. It is usually recognized by the description that the patient gives. The rate is about 160, but may be up to 200 per minute.

*Auricular Flutter.*—The next important disturbance is known as auricular flutter, which is due to a circus movement through the auricular muscle. According to Dr. J. C. Meakins,

> "This movement, which begins at one point in the auricle, continues through a strip of muscle to begin again at a point where it is initiated. This does not produce a contraction of the auricle *in toto*."

Dr. J. E. Tally thinks it is due to a circus movement which revolves around the vena cava. It is a smooth, regular wave which keeps to one plane so that the ventricle receives rapid regular impulses. The rate of the circus movement is from 260 to 320 per minute. The ventricle usually responds to half this rate, or about 150 per minute, so that there is really a two-to-one heart block. The ventricle might be able to respond more rapidly if the auriculoventricular node and bundle could conduct impulses with sufficient rapidity. It cannot conduct impulses at more than 200 per minute and, therefore, when the impulse resulting from the circus movement arrives at the auriculoventricular node, the node is refractory, allows the circus movement to go by, and waits for the next movement to take up the rhythm. The sug-

*Read in Section on Medicine, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

gestive things about its diagnosis is the long duration and constant ventricular rate. It lasts for months and years unchanged. It occurs more often in elderly men. The rapid rate is unchanged by posture or exercise.

*Auricular Fibrillation.*—The next type of auricular arrhythmia is auricular fibrillation, or delirium cordes, as it was called by the older physicians when irregularities were little understood. Sixty or 70 per cent of patients with cardiac failure show this form of total irregularity. There is some debate as to whether auricular fibrillation is a single circus movement, traveling an irregular path at 450 per minute, or multiple circus movements passing in different directions. Therefore, there is a swarm of irregular impulses from the sino-auricular node stimulating the ventricles at irregular intervals. But, as these impulses arrive at the auricular ventricular node, irregular in their intensity or rhythm, the ventricle responds irregularly.

A history of persistent irregularity of the heart, coupled with a history of rheumatic fever, chorea, interstitial nephritis and advanced exophthalmic goiter, suggests auricular fibrillation as a cause. The diagnosis of auricular fibrillation is made at the bedside by a study of the pulse, the apex beat, and the influence of heart rate on the irregularity. In all the arrhythmias, but in this one in particular, the rapid pulse is an indefinite sign of ventricular activity because many beats fail to reach the wrist so that commonly there is a pulse deficit. The irregularity is most evident when the ventricular rate is from 120 to 160. The radial pulse then is a medley of beats of varying strengths and pauses of different lengths. There is a continuous intermingling of normal, weak, strong, lost and returning beats. There is no relation between the size of the beat and the length of the preceding pause. When the rate of the ventricle is slow, 90 or below, the disorder is less pronounced, is harder to recognize and instrumental means may be necessary for diagnosis, but the ventricle may be made to beat faster and thereby aid in the diagnosis.

The study of the relation of this irregularity to heart rate is a certain and simple means by which auricular fibrillation may be recognized clinically. Moderate exercise, amyl nitrite, and the presence of fever will increase the heart rate whether we have a regular sinus rhythm or fibrillation. With the increase of heart rate above 120, the irregularity always increases in fibrillation; whereas, the irregularity due to extra systoles, partial heart block or sinus arrhythmia is wiped out by increase in heart rate. Again, as the heart rate slows at rest after exercise, the ventricular irregularities grow less in fibrillation; whereas with rest, irregularity due to extra systole or partial heart block returns.

Quoting from Dr. James E. Tally:

"A persistent ventricular irregularity in a patient with evident signs and symptoms of serious heart failure, especially if the heart rate is high, is almost always due to auricular fibrillation. Indeed, when a ventricle beats at 120, or above, the irregularity is almost always due to auricular fibrillation. Auricular fibrillation, once established, is usually persistent year after year though, of course, it may occur in paroxysmal form."

*Heart Block.*—This is a condition due to the blocking of the impulses in their progress through the auricular ventricular node and bundle. The block may be complete or incomplete. If incomplete, the ventricle responds to each second or third auricular contraction or there may be dropped beats. These variations are but degrees of the one general impediment of conduction. In the case of premature beats a weak movement will be heard at the apex; whereas in the case of heart block, there will be no ventricular contraction.

Usually there is a regular ventricular rate of about 40 per minute. A sudden exact halving of the ventricular rate which abruptly doubles under exercise is suggestive of heart block.

In complete heart block, the auricle and ventricle beat entirely independently. The ventricle beats perfectly regularly at a rate of from 28 to 35 and the auricle at fully double that rate.

The vagus has little influence over the ventricular rate in complete heart block, so that ordinary exercise, amyl nitrite or atropine does not have the usual influence in increasing the heart rate.

Ordinarily speaking, partial heart block is an unstable condition, whereas complete heart block, when once established, is apt to be permanent.

There are two phases of heart block that lead to Stokes-Adams' syndrome. One of the dangerous times occurs when the partial heart block is passing to complete heart block and then back to partial heart block again.

Occasionally a patient will have, for some weeks, rates varying from 50 to 40 to 30, changing from day to day accompanied by fainting and unconsciousness. These rates mean that he has passed, in quick succession, from two-

to-one heart block, and then to complete heart block and then again reversed the order.

Again, in complete heart block with a ventricular rate of 30, in certain patients, there is a sudden slowing of rate to 20-12 or 8 per minute, which leads to the full-blown syndrome.

*Management.*—Determine, as accurately as possible, the etiological factor in each case of cardiac disturbance. We are familiar with the havoc that such diseases as inflammatory rheumatism, syphilis and miscellaneous infections such as scarlet fever, pneumonia and typhoid fever, can cause in the heart.

There is another group of cases that has the etiological factor, hyperthyroidism.

In all cases of cardiac irregularities, if there is not an obvious cause such as inflammatory rheumatism, syphilis or an immediate preceding infection, hyperthyroidism must be considered in spite of the fact that symptoms associated with hyperthyroidism may not be obvious. Remember, in the interpretation of the basal metabolic rate, that patients with heart failure are prone to run a high rate; so be careful not to be misled.

In another group of cases, hypertension is the cause. The smaller arterioles are the seat of the lesions, particularly if coronary thrombosis occurs; then paroxysmal tachycardia, auricular flutter and auricular fibrillation may occur in consequence.

There are cases of cardiac irregularities in older people which are benign.

Having done all we can do to clear up the pathological condition that causes arrhythmia, the next question is, "What can we do for the arrhythmias?" In many cases we cannot restore the normal rhythm, yet we can render the patient comfortable and give him a reasonable amount of economic usefulness.

In using drugs for the treatment of heart disease, we must have a thorough understanding of their action.

I shall quote, at some length, here from Dr. J. C. Meakin, who gives a very accurate interpretation of the action of drugs on irregular hearts.

"There are two principal drugs which may be used in regular or irregular tachycardias due to excitation from an abnormal focus. These are digitalis and quinidine. In brief, the pharmaco'ogical action of these drugs is as follows: quinidine reduces the vagus tone and thus increases the conduction, particularly through the auriculoventricular connection, and prolongs the refractory period in the auricle thus slowing the rate of impulse response in this muscle. Atropine has a somewhat similar action on the vagus. Digitalis has an action somewhat opposite to quinidine although not in the same order. Its influence over the vagus seems to be stronger than that of quinidine in that it is more powerful in decreasing the conduction through the auriculoventricular connection, thus retarding the impulses to the ventricles. In addition, there is evidence to indicate that it may have a direct action on the auriculoventricular node, producing a similar effect, but its action on the auricular muscle is less conspicuous than that of quinidine although antagonistic in that it decreases the refractory period.

"It is possible to use these two drugs in combination so that the more powerful action of each may predominate.

"In short, quinidine slows the fibrillation or fluttering auricle but tends to increase the conduction of the impulses to the ventricle; thus increasing the ventricular rate.

"Digitalis, on the contrary, having a slight action on the auricular muscle, tends mildly to accelerate the auricular circus movement; but its strongest action is in decreasing the auriculoventricular conduction, greatly reducing the ventricular rate.

"Both drugs appear to have a quality in common, in that in toxic doses they increase the irritability to stimuli of the myocardium, particularly the ventricle. Thus, they may, in toxic doses, produce ventricular tachycardia.

"In addition, toxic doses of digitalis, by retarding the conduction through the auriculoventricular node, are capable of producing heart block, either partial or complete."

Now the rational use of these drugs in auricular flutter and fibrillation may be considered. In auricular fibrillation the circus movement is rapid. Digitalis makes it more so, but at the same time retards the conduction through the auriculoventricular node and leads to a slowing of the ventricle. These actions do not tend to restore normal rhythm, but through slowing of the ventricle increase the efficiency of the circulation and thus remove the signs of congestive failure provided the slow heart is efficient.

In auricular flutter similar results may be obtained with digitalis. The auricular circus movement increases in rapidity until it is indistinguishable from fibrillation. This artificial increase may take the auricle break away from the circus movement and the domination of the normal sino-auricular rhythm may be established. All the while, its action on the auriculoventricular tissues is to slow the ventricular rate in spite of the increase in the auricle.

Quinidine, by increasing the refractory period in the auricle, slows the circus movement in both auricular flutter and fibrillation, but during that time the ventricular rate may be increased to an alarming degree unless digitalis has been

given previously to offset the effect of quinidine.

It is quite possible to precede the full course of quinidine by a short period of digitalis until the ventricular rate is under 100. It may take three or four days to accomplish this. It is then followed with quinidine.

Irregularities arising in the auriculoventricular tissues are usually due to incomplete heart block. Under such a condition agents are indicated which either stimulate the sympathetic system or decrease the action of the vagus. Quinidine and atropine have already been considered. Other drugs that stimulate the sympathetic are: thyroid extract, epinephrine and ephedrine.

The etiology, in each case, should have careful consideration and the cause should be removed, if possible. Remember, a large percentage of these cases is due to inflammatory rheumatism, syphilis and coronary disease. In acute cases the use of atropine, thyroid extract, epinephrine and ephedrine deserves first consideration. Dr. Wood, of the University of Virginia, has done considerable work with ephedrine sulphate and he recommends it in 3/8 grain doses in those cases of heart block in which Stokes-Adams' syndrome has been proven, or at least strongly suspected. However, many cases of heart block do well without any medication.

Some writers advocate the use of atropine sulphate in increasing doses up to the pharmacological limit, if necessary, to get the desired effect. These drugs, as you know, increase the conduction through the auriculoventricular node.

In treating thyrotoxicosis we all know the difficulty of obtaining the desired effect of digitalis on the auriculoventricular tissues in auricular fibrillation and flutter. The amount of digitalis required is quite excessive, as thyroxine acts as atropine does.

Thyrotoxic patients with auricular flutter have fast ventricular rates and digitalis has but little effect during that period. If we reduce the thyrotoxicosis by the use of Lugol's solution, the digitalis will act more effectively.

Extra systoles on retiring, according to Dr. J. E. Tally, in individuals who are especially disposed when tired out physically and nervously, may be distressing and sleep-destroying. In these individuals quinidine sulphate, in doses of 2 to 3 grains three times daily, and sometimes less often, has finally abolished the extra systoles. However, some patients have to continue the treatment for months. After prolonged vacations with mental rest and needed physical exercise, they have been free from premature beats of which they were conscious.

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DISCUSSION (*Abstract*)

*Dr. Neuton S. Stern, Memphis, Tenn.*—From the clinical point of view, I have found it convenient to divide the arrhythmias into five groups, depending upon the type of arrhythmia found upon examination. (1) If there are phasic changes, with rhythmic slowing and increasing of the rate, sinus arrhythmia is present. (2) If there is a premature beat with an otherwise normal rhythm, the change is due to an auricular premature beat. (3) If there is a premature beat followed by a compensatory pause, it is due to a ventricular premature beat. (4) A dropped beat may be due to two causes, either a ventricular premature beat which can be heard at the heart with the stethoscope or a low-grade heart block, in which there is no sound with the dropped beat. (5) A pulse with absolute irregularity is due to auricular fibrillation.

*Dr. C. Sidney Burwell, Nashville, Tenn.*—I wish to make two points regarding the paper of Dr. Hart. It is certainly true that syphilis is a frequent cause of heart disease, but it is also true that important cardiac irregularities are not frequent in syphilitic heart disease. Indeed auricular fibrillation, the common severe arrythmia, is quite rare in syphilis.

The second point has to do with the choice of treatment of auricular fibrillation as between quinidine and digitalis. Quinidine when effective abolishes the arrythmia. Digitalis exerts its favorable effect in these cases chiefly by slowing the rate. In particular, when auricular fibrillation has lasted months or years and in those who have suffered from congestive heart failure there is a definite danger of embolism resulting from the resumption of normal auricular activity. In general, therefore, quinidine should be used for the treatment of auricular fibrillation only in patients who have not had heart failure and when the arrythmia itself is of relatively short duration.

*Dr. Virgil E. Simpson, Louisville, Ky.*—In the effort to appear practical, the temptation to discredit scientific instrumental accomplishment is, too frequently, irresistible. Nowhere is this more true, more unfortunately true, than in the group of cardiac arrhythmias. Until the polygraph and the electrocardiograph made differentiation possible clinically this group of heart conditions was merely cardiac arrhythmia. There was no fluttter, no fibrillation, no premature contraction, no extra systole. Instrumental study has made a clinical entity of each; it has made possible a differentiation of these irregularities at the bedside by physical examination alone in a large proportion of cases; it has advanced cardiac therapy intelligently and helpfully. Surely it should not offend the ego of the physician were he honestly to recognize and acknowledge his indebtedness to instrumental study. Such recognition and acknowledgement does not offend an unprejudiced mind. It is just as important to appreciate the accomplishment of instrumental study as it is necessary to acknowledge the limitations of such study. To do otherwise is neither scientific nor practical.

The phrase "goiter heart" is a common usage. If one wishes merely to associate a cause with an effect the term is permissible. It should not be used, however,

to connote a definite pathological condition. There is a characteristic pathological picture in an arteriosclerotic heart, a rheumatic fever heart, perhaps, a luetic heart; but a cardiac death in scarlet fever or diphtheria or pneumonia or thyrotoxicosis could not be diagnosed by the pathologist alone. It is true that, clinically, one comes to expect certain functional disturbances in this or that or the other one of the just mentioned diseases. I think that fibrillation is a rather common accompaniment of a thyrotoxic state and I think I have encountered it more often in the toxic adenomatous thyroid than in the toxic hyperplastic thyroid. But cardiologists are rather in general accord, I feel, in the opinion that sections of such a heart would give no definite idea of the cause if it were known, clinically, that the heart in question belonged to a goitrous subject. Blood pressure studies in goitrous subjects, like the pathological study, are not helpfully diagnostic. Both high and low pressures are found in both hypo and hyperthyroidism. If any dogmatic statement be warranted in thyroid disease, it is that the pressure findings are labile.

## THE USE OF SODIUM ISO-AMYLETHYL BARBITURATE (SODIUM AMYTAL) IN THE TREATMENT OF ECLAMPSIA*

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Eclampsia maintains a high incidence of mortality and morbidity, in spite of the many advances that have been made in the prevention and management of obstetric complications. Numerous therapeutic measures have been employed in controlling eclamptic convulsions, but there has not as yet been developed a drug that has yielded entirely satisfactory results.

Further investigations are obviously necessary to devise therapeutic measures to control eclampsia, and studies of the possibilities of any drug, even though it is not included among those commonly in use, may contribute to this desirable end.

Experimental and clinical investigations have shown conclusively that the barbituric acid derivatives have a distinct therapeutic value in the control of convulsions from various causes. It has been demonstrated repeatedly that the intravenous use of phenobarbital and other barbituric acid derivatives is most effective in the control of convulsions such as may occur in tetanus, rabies, status epilepticus, meningitis, intracranial injury, strychnine and cocaine poisoning.

Robbins[1] and his collaborators have priority in the use of sodium iso-amylethyl barbiturate (amytal) for the control of eclamptic convulsions. They reported in September, 1929, that they had used sodium amytal in eight cases in which the convulsions were immediately controlled. Although their report was exceedingly brief, it is evident that they obtained favorable results.

Hamblen and Hamblin[2] have reported the oral use of sodium amytal for the control of eclamptic convulsions. They reported good results in fourteen cases. In our personal experience in the use of amytal by the oral route we were not able to control the eclamptic convulsions immediately. We cannot conceive how eclamptic convulsions could be controlled at once by oral administration. One must realize that it takes from thirty to forty minutes for the therapeutic effect to be reached, and again that the dose must be much larger than by the intravenous route.

Watt[3] reported the use of amytal intravenously in seven cases with complete control of the convulsions.

King, Mayer and Ayo[4] recently reported the use of sodium amytal intravenously in thirty cases of eclampsia with prompt control of the convulsions in every instance, but they had used morphine prior to the administration of amytal.

The possibilities of sodium amytal for the control of convulsions in eclampsia were first brought to our attention by the observation and successful treatment of a case of chorea gravidarum at the Nashville General Hospital in January, 1929, with phenobarbital. Soon after this, sodium iso-amylethyl barbiturate came into our hands and it occurred to us that it might be a very useful drug for the control of eclamptic convulsions. We have since used it to the exclusion of all other forms of sedatives: morphine, magnesium sulphate, and so on.

We first used sodium amytal for the control of eclamptic convulsions in January, 1930. Now that three and one-half years have elapsed, it seems desirable to report the results obtained in order to indicate, as far as possible, the value of the drug in this connection.

This preliminary report deals with a series of forty-five cases of eclampsia that have been studied in the wards of the Nashville General Hospital and in consultation practice during the past three and one-half years.

The primary purpose of this paper is to il-

*Read in Section on Obstetrics, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

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lustrate the importance of sodium iso-amylethyl barbiturate (or sodium amytal) in the control of convulsions during the treatment of patients with eclampsia, but opportunity will also be taken to present and discuss the clinical data of this series of cases.

Cases at the Nashville General Hospital were under the direct supervision of the resident obstetricians, Dr. Hamilton and Dr. Bushart, and to them credit is given for carrying out the treatment.

In this series of cases only one patient received any prenatal care and the great majority of patients studied had eclamptic convulsions prior to admission.

Table 1

| | |
|---|---|
| Number of patients treated | 45 |
| Patients receiving prenatal care | 1 |
| Primipara | 22 |
| Multipara | 23 |
| Ages | 17 to 36 years |
| White | 37 |
| Colored | 8 |
| Antepartum cases | 41 |
| Full term | 26 |
| Eight months | 12 |
| Seven months | 2 |
| Six months | 1 |
| Postpartum cases | 4 |
| Full term | 2 |
| Eight months | 2 |

All the patients in this group, except one, gave a history of either headaches or edema lasting over periods of from two days to two months. On physical examination, seventeen showed extreme generalized edema, twelve had only moderate edema, eleven had slight edema, and five showed no demonstrable edema. From the group, twenty-four showed four plus albumin, nineteen two plus, and two showed no albuminuria.

All had marked elevation of blood pressure except two cases of the postpartum type. The systolic blood pressure ranged from 110 to 220 on admission and in ten cases it was over 200. The diastolic pressure varied from 60 to 140 and in forty cases it was over 100.

The majority of patients had convulsions prior to admission. The number of convulsions prior to treatment are shown in *Table 2*.

Table 2

| | |
|---|---|
| Antepartum cases | 41 |
| 1 patient had 10 convulsions | |
| 24 patients had 6 or more convulsions | |
| 16 patients had 3 or more convulsions | |
| Postpartum cases | 4 |
| 1 convulsion each | |

Twenty patients had a total nonprotein nitrogen in the blood of 38 or less. The blood sugar in all but one case was below 100 mg. per 100 c. c. The determinations were all taken soon after admission.

Forty-one of the forty-five patients recovered. The details of the four fatal cases are as follows:

*Case 1.*—A white woman, aged 24, para 2, eight months pregnant, had had no prenatal care. She was admitted to the hospital with a history of headache and edema for the previous two days. Her blood pressure was 165/120. Urinalysis showed albumin one plus, blood chloride 180 mg., blood sugar 100 mg., nonprotein nitrogen 38, and blood calcium 7.5 mg. per 100 c. c. The fetal heart rate in the right lower quadrant was 140. One hour after admission she had a convulsion and continued to have convulsions in rapid succession. Sodium amytal, 7.5 grains, was given intravenously, the entire amount in two minutes.

Eight minutes later the patient became cyanotic; her blood pressure dropped to 70/30, and pulmonary edema was evident. With heroic treatment she recovered from cardiac and pulmonary collapse in five hours, at which time her blood pressure was 110/70.

Twelve hours after her recovery, labor was induced with a Vorhees' bag. Spontaneous delivery occurred eight and one-half hours after induction, of a stillborn baby, weight five pounds and fifteen ounces. The blood pressure after delivery was 110/50.

The patient's condition seemed satisfactory until twenty-four hours postpartum when she died suddenly. Cerebral embolus was possible, but there was no autopsy.

In the treatment of this case it is now felt that the barbiturate was given too rapidly, contrary to all rules. Induction was also performed entirely too soon after the apparent recovery from the cardiac collapse so that a considerable sacrifice of conservatism was made, although the blood pressure had returned to normal, the patient seemed to be in good condition, and remained so until twenty-four hours after delivery. It is felt that if induction had been delayed for a longer time after the amytal administration, the chances for a more favorable outcome would have been certain.

*Case 2.*—A white primipara, aged 18, seven and one-half months pregnant, had had no prenatal care. She was admitted to the hospital complaining of severe headache and visual disturbances, with marked edema for the preceding week. Urinalysis showed one plus albumin, nonprotein nitrogen 30, blood chloride 485, blood sugar 100 mg., blood pressure 200/130, and the fetal heart in the right lower quadrant.

Twelve hours after her admission she had a convulsion. Sodium amytal, 7.5 grains, was given intravenously immediately after the convulsion. Her blood pressure after amytal was 150/110. Two hours later sodium amytal, seven and one-half grains, was given intramuscu-

larly. Her blood pressure was 188/146. She was actively treated by the eliminative method. She did not improve, and it was impossible to promote diuresis. She died twelve hours after the last amytal injection, undelivered.

This death was due solely to the fulminating type of toxemia. When the patient showed no improvement with medical treatment, possibly a cesarean section earlier would have been better; but who knows?

*Case 3.*—A colored woman, para 2, aged 17, six and one-half months pregnant, had had no prenatal care. She was admitted to the hospital in convulsions, with a blood pressure 200/120. The fetal heart was not heard. There was no edema. Urinalysis showed four plus albumin, and many hyaline and granular casts. The blood nonprotein nitrogen was 35, and the blood sugar 90 mg. Seven and one-half grains of sodium amytal were given intramuscularly. Sclerosis of the veins from previous glucose injections in her first pregnancy prevented intravenous introduction.

Under eliminative treatment the patient failed to improve. Labor was induced with a Vorhees' bag, but she died undelivered twelve hours later. The cause of death, no doubt, was the fulminating type of toxemia.

*Case 4.*—A white woman, aged 33, para 2, was seven months pregnant. There was a history of eclampsia with her first pregnancy ten years before. She had had prenatal care by a competent physician. Five weeks prior to her admission to the hospital, she presented symptoms of toxemia of pregnancy. The blood pressure was 162/110, with a rapid gain in weight. The urine was negative. Under a restricted diet the patient responded promptly. Her blood pressure returned to normal and continued so until two days prior to her admission to the hospital, when it rose to 198/120 and the urine showed two plus albumin. The patient refused hospitalization believing that her physician exaggerated her condition. She was admitted to the hospital after much persuasion, with a blood pressure of 210/120, albumin two plus, hyaline and granular casts, and no edema. The blood nonprotein nitrogen was 30 mg., urea 30 mg.; Wassermann and Kahn were four plus.

Soon after admission she had a convulsion and was given sodium iso-amylethyl barbiturate (amytal) 7.5 grains. She had no further convulsions, and was not in labor. She was treated actively for two days with no improvement. The cervix was dilated to three fingers and the membranes ruptured artificially. She did not go into active labor. She died of edema of the lungs and cardiac collapse two days after admission, undelivered.

There was some doubt about the diagnosis of eclampsia in this case. Death was due to uremia.

The maternal mortality in this series was 8.8 per cent.

We realize that the infant mortality is probably open to criticism, but when one notes that of the sixteen stillborn infants, fourteen were eight months or less, it is questionable that any other procedure would have lessened our infant mortality. This is especially true when one realizes that the toxemia affects the infant as well as the mother.

Table 3

FETAL MORTALITY

| | |
|---|---|
| Total number of infants delivered | 44 |
| Live births | 31 |
| Stillbirths | 16 |
| Total number of babies undelivered | 3 |
| Twin deliveries | 2 |
| Fetal mortality, per cent | 34 |
| Of the 31 live births | |
| 5 infants were premature | |
| 26 infants were full term | |
| Of the 16 stillbirths | |
| 14 infants were premature | |
| 2 infants were full term | |

ROUTINE MANAGEMENT OF CASES

(1) The treatment used in this series of cases, except for the administration of sodium iso-amylethyl barbiturate, presents certain features of well known methods and will be modified whenever increasing knowledge shall produce other therapeutic measures of greater promise. The prime object was the immediate control of convulsions by the intravenous injection of this preparation as soon as possible after the convulsions.

The drug is prepared in a white crystalline form and is sealed in pyrex ampoules. A 10 per cent solution has been found satisfactory for intravenous use. Ten c. c. of sterile distilled water are mixed with the sodium amytal by gentle agitation, and, as a rule, in one to three minutes a clear solution results. If the solution is opaque, it should be discarded as a clear solution is desirable. For the injection, a 10 c. c. syringe is used with a 22-gauge intravenous needle, and the solution is injected at the rate of 1 c. c. per minute.

The initial dose varies between 7.5 and 15 grains. This is repeated in one to two hours if the patient becomes restless or a convulsion seems imminent. It is seldom necessary to give more than two or three doses, and usually we give the second or third dose intramuscularly after the control of the primary convulsion. We feel that the intramuscular injection repeated at intervals as desired will sufficiently protect the patient from any further convulsions. At least that has been our experience.

Although we use sodium amytal freely and do not fear to give 7.5 grains as many times as necessary, our largest dose for any one case was 58.5 grains over a period of three days. We have been guided entirely by the restlessness and the general condition of the patient. In

only one case was there a respiratory disturbance, due to introduction of the drug too rapidly by one of the interns on the service who was not accustomed to dealing with eclampsia.

It has been noted that the action of the drug is extremely rapid. In one to three minutes after its use the patient relaxes and drops off into a deep sleep.

In every instance except one the blood pressure declined after the drug was administered. The decline in systolic pressure varied from 21 to 90 mm. of mercury and the decline in diastolic pressure varied from 5 to 60 mm. of mercury. The average decline of the systolic pressure was 43 points, the diastolic pressure 26 points. The time required for the lowest decline varied from ten to fifty minutes, the average being twenty-seven minutes. It has been our experience that the higher the original systolic blood pressure, the greater is the decline following the administration of the barbiturate. In *Case 1,* with severe pulmonary edema and shock, the time for the return of the blood pressure to its normal height was eight and one-half hours.

There seemed to be a tendency of the systolic pressure not to reach the original levels; only three of my series returned to the original level or above. This suggests the possibility that sodium iso-amylethyl barbiturate may permanently lower blood pressure. However, four of the diastolic pressures returned to a higher level than before the injection. The average time for the approximate recuperation of the blood pressure, including *Case 1,* was three and one-half hours.

The results in this series of cases in the control of eclamptic convulsions have been uniformly good. In sodium iso-amylethyl barbiturate we have found an agent which, on intravenous injection, yields results far better than those of any other drug which we have used thus far. In no case have we been unable to control the convulsions. That it will have a very definite place in the control of convulsions in eclampsia seems assured. Until now, the control of convulsions has been most unsatisfactory; sometimes they have been controlled and sometimes not. If this barbituric acid derivative, sodium amytal, has the virtues indicated, we believe it should be given a thorough trial in almost all convulsions.

It is not claimed that it has any other curative virtue in eclampsia, but certainly one of the most important steps in the treatment of eclampsia is to control the convulsions, thereby enabling one to go ahead with the other important measures in the treatment without disturbance or interference. This is of paramount importance when one realizes how difficult it is to treat the patient intelligently if continual interference is being offered by repetition of the convulsions.

It must be distinctly understood that all cases of eclampsia are considered primarily as medical ones and are treated as such. Not until we have the case under control do we think of it as an obstetrical one. But realizing that delivery of the patient has a very marked influence on the toxemia, we are of the opinion that delivery should not be hastened until the patient is under control.

(2) As soon as the effect of the amytal is obtained, gastric lavage is done through a nasal tube with soda water and 4 to 6 ounces of 50 per cent magnesium sulphate are left in the stomach. Although there is some controversy in the literature on the rationale of gastric lavage in eclamptic patients, in that it may initiate a convulsion, we can say from experience that under amytal sedation the procedure is without this danger, and believe that any objection is outweighed by the beneficial effects of introducing fluids and purgatives into the unconscious patient.

(3) Soap suds enema or colonic irrigation is continued until the flow is clear.

(4) Five hundred to 1,000 c. c. of 25 per cent dextrose in freshly distilled water are given intravenously, and repeated every eight hours until a diuresis is established and maintained. This is best detected when the specific gravity of the urine reaches 1.010. In regard to the administration of large amounts of fluids to promote diuresis and elimination, we should like to emphasize the importance of restricting fluids in those cases that have marked edema. We have felt that in several cases we have overstepped the patient's tolerance, especially when the output was much less than the intake; and we firmly believe that in these cases a reduction of the fluid intake is indicated.

(5) Eight ounces of water or fruit juice sweetened with one teaspoon of sugar are given through the nasal tube every two hours until the patient is conscious and able to take fluids by mouth. This is continued for two days after delivery.

(6) If edema of the lungs or acute cardiac collapse is imminent, we administer a digitalis preparation (digifolin) 1 c. c. intravenously or

intramuscularly every two hours until the desired effect is obtained.

(7) The method to be employed in terminating pregnancy is our chief concern. If the patient is in labor we permit her to continue naturally. If not, we feel that labor should be induced, but only after the convulsions have ceased and the patient is out of shock. If she is at, or near term, rupturing the membranes is probably the procedure of choice. In the use of the bag to induce labor, we are at present greatly disappointed. We believe that it is too slow and uncertain in its action both in eclampsia and in pre-eclamptic toxemia. Although we have used the bag in sixteen cases of this series, we are still of the opinion that rupturing the membranes is the method to be performed, and it was followed in twenty-six cases of this series.

In either method, however, inhalation anesthesia, other than gas-oxygen, is discouraged. In the majority of cases we have been able to use sodium amytal and local infiltration most successfully.

(8) Labor, as a rule, is allowed to terminate spontaneously. Thirty-three cases were terminated in this manner. Low forceps were resorted to in eight cases. Version and breech extraction were used in one case. Cesarean section was performed in one case. Three cases were undelivered. The average length of labor for those cases delivered was eighteen and one-half hours.

*Cesarean Section.*—We approach the subject of cesarean section in the treatment of eclampsia with an open mind and believe that there is a small but definite group of cases in which section has a very distinct though sharply restricted field. I have in mind those rare patients, usually primiparous, admitted to the hospital apparently in good condition, but who rapidly fail under the most careful medical regime and in whom vaginal delivery would entail delay. In such cases when improvement does not occur in six to twelve hours, and failure to improve is manifested by unsatisfactory diuresis, coma which is not lessening, pulse, temperature and blood pressure which are increasing, we believe the prompt termination of pregnancy by section under local anesthesia offers the greatest possibility for success.

It is of interest to report that in only one case was cesarean section resorted to. This was in a primipara in whom section was performed under amytal anesthesia after the patient had been sufficiently treated medically.

In closing we should like to emphasize the fact that mild cases will recover regardless, if they are conservatively treated. It is also true that certain severe cases must be handled by early delivery, but all will recover if the disease has not persisted too long and the damage has not been too great. Favorable and unfavorable results based on the conservative methods suggest that each case must be individualized and experience and judgment are necessary.

## CONCLUSIONS

Study of the results obtained in this series of cases appears to justify the following conclusions:

(1) Sodium iso-amylethyl barbiturate (amytal) 7.5 to 15 grains intravenously, repeated at necessary intervals, will control the convulsions of eclampsia.

(2) Sodium amytal permits one to treat the patient intelligently without recurrence of the convulsions.

(3) Immediate delivery in eclampsia by radical operative procedures is unnecessary in both the mild and severe types.

(4) Rupturing the membranes seems to be the procedure of choice in inducing labor.

(5) Labor, as a rule, is allowed to terminate spontaneously.

(6) Inhalation anesthesia, other than gas-oxygen, should be discouraged.

(7) Cesarean section, under local anesthesia, is indicated in a few cases that do not respond to adequate medical treatment within six to twelve hours.

(8) Favorable or unfavorable results suggest that each case must be individualized.*

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## DISCUSSION (*Abstract*)

*Dr. Wm. T. McConnell, Louisville, Ky.*—Every system of conservative treatment of eclampsia is built upon the two fundamental factors, elimination and sedation. To employ either of these agents to the exclusion of the other is to fail to give our patients the best chance for recovery.

*Since this paper was submitted for publication, five additional cases of eclampsia have been treated with sodium amytal with equally gratifying results.

Perhaps the ideal sedative has not as yet been discovered and yet Dr. Lewis' experience with a barbiturate, sodium amytal, indicates that a drug has been found which is practicable and which gives the desired results. We have been using this drug as a routine in our work at the Louisville City Hospital in all cases of eclampsia since January 1, 1930. During this time we have had 7,374 deliveries with 50 cases of eclampsia, or an incidence of 0.66 per cent. Seven of these patients have died. Only one of them ever attended our prenatal clinic and this patient came to the clinic in November and was not seen any more until she came in *in extremis* in April. Practically all of these seven deaths were in patients who came to us when they were beyond any hope of human help. As far as I can remember or can ascertain from the records of the hospital, in no patient did sodium isoamylethyl barbiturate fail to control the convulsions. Two patients experienced a mild shock following administration of the drug, but in both instances it was apparent, as in those cases reported by Dr. Lewis, that the solution had been injected too rapidly. We have adopted the method of using 7.5 grains intramuscularly immediately upon admission.

In my private work I prefer the intravenous method, as I have never seen any bad results when the injection is made slowly.

Dr. Lewis brought out a point in his paper that I would like to emphasize, and that is that sedation should be administered in every case of eclampsia, even though the patient is in coma. Every eclamptic patient is suffering from a heightened nerve sensitiveness and unless adequate sedation is administered before other forms of treatment are instituted, the very manipulation of the treatment is often sufficient to produce shock. For instance, we never administer gastric lavage until after sedation is complete. If this rule is followed, a number of the most vigorous forms of treatment will be borne well by the patient, which would otherwise prove disastrous.

In former years we used morphine, and later ether-oil by rectum, but we have adopted sodium amytal as the most satisfactory of any of the sedatives so far proposed. It is seldom necessary to repeat the 7.5 grain dose, and, until better methods are devised, we expect to continue in our present routine.

*Dr. W. T. Pride, Memphis, Tenn.*—While I am a strong advocate of sodium amytal during delivery, I have had no experience with its use in eclampsia.

If it will reduce the death rate as Dr. Lewis says, we should use it routinely. I am not thoroughly convinced of its value and complete safety in such cases, and shall be glad to read further reports.

*Dr. Lewis (closing).*—I was particularly gratified to hear that Dr. McConnell has used sodium amytal intravenously for the control of eclamptic convulsions with as good results as those reported in my series of cases.

When one realizes that it takes twenty to thirty minutes for morphine to be effective, the advantage of the rapid action of sodium amytal can be appreciated.

Prior to 1929, we used magnesium sulphate with very indifferent results. Sometimes the convulsions were controlled and sometimes not. Since the routine use of sodium amytal intravenously, we have come to the conclusion that it is the drug "par excellence" for the control of convulsions.

## SPECIALLY PRODUCED MILK IN THE SOLUTION OF THE GOITER PROBLEM*

*By* WILLIAM WESTON, M.D.,
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In discussing any suggestion for the solution of the goiter problem one must constantly keep in mind the investigations of Professor Chatin, of Paris, between 1850 and 1854. Following these investigations he announced that where the soils and waters were relatively high in iodine, goiter was unusual, but where they were low in their iodine content many cases of goiter and cretinism were observed. His views were severely criticised for a period of several years, and his announcement was received with skepticism. However, during the past two decades, since the technic of iodine determination has been improved and facilities for careful scientific investigation have been extended, his observation has been fully confirmed.

Until within recent years we were unable fully to account for sporadic cases of goiter discovered in nongoitrous districts. These cases have appeared where there was a great abundance of iodine in the soils and waters and where locally grown or produced foods were available. In the whole field of nutrition no food factor or element has received more careful study than has iodine in its intricate relationships. These studies have revealed explanations of facts that were heretofore mysteries.

Recent studies suggest that probably there are various factors that increase the needs of the body for iodine and iodine-containing hormone or hormones, and which are concerned in the development of endemic goiter. The deficiency of iodine may be due to: (1) factors which bring about an abnormally low intake of iodine; (2) factors which interfere with absorption or utilization of an otherwise adequate intake; (3) factors which increase the needs of the body for the iodine-containing hormone. The low iodine content of foods and water are the important factors which bring about a low intake of iodine. Interference with absorption and utilization of an otherwise adequate amount of iodine may be caused by intestinal bacteria or the lack of a vitamin or hormone. Recent evidence has been presented concerning the factors which create an increased need of iodine in the body. Re-

*Read in Section on Pediatrics, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

cently, attention has been called by Webster, Chesney and Clawson[1 6] and subsequently confirmed by Marine and others[7] to the fact that the feeding to rabbits of cabbage and other members of the Brassica group of vegetables such as Brussels sprouts and cauliflower grown in certain localities, brings about goiter in a relatively short time. This is caused by the presence of mustard oils which yield cyanides on hydrolysis. These and other investigators[8 9] find that there is a distinct seasonal variation in the goitrogenic activity of members of the Brassica group of vegetables. When cabbage is dried in the air or *in vacuo* it loses its goitrogenic power,[10] and steaming cabbage for 30 minutes increases its goitrogenic potency. When steamed cabbage is pressed, the residue or cake contains all the active substance while the juice contains none.[11] It is a significant fact that if enough iodine is added to the diet to care for the increased demand created by cyanides, goiter does not result. The presence of cyanides in cabbage is not the sole reason for its goitrogenic influence, because it has been found that cabbage is an unusually rich source of calcium.

Culhane,[12] Dupré and Semonoff[13] all found that the feeding of cabbage raises the calcium content of blood serum. Baumann, Kurland and Metzger[14] found that when goiter is produced in rabbits by cabbage feeding, there results a definite retention of calcium, phosphorus and magnesium in the body with resulting loss of balance. When iodine is administered to cure such goitrous animals, there is a restoration of balance in these elements which is brought about by an increase in the amount excreted.

This discovery is added evidence of the interdependence of the chemical elements upon each other and this particular discovery throws much light upon the factors entering into the processes that determine growth and development.

Light has recently assumed importance as a factor in the etiology of goiter. Sorour,[15] Remington[16] and others found that rats kept in darkness develop goiter much more quickly than those kept in strong daylight. Rats fed on a goitrogenic diet when exposed to ultraviolet light develop goiter much more slowly than do the control group.

Lieben[17] and Kraus[18] report that when iodized protein or thyroid tissue is irradiated with ultraviolet light a liberation of the iodine results. Pincussen and Roman[19] found that when mice were irradiated with ultraviolet light, a conversion of organically bound iodine into inorganic or ionizable iodine resulted. Levine and Remington[20] interpret this finding as suggesting either that the body requires ionizable iodine for the formation of thyroxine; or in order to exert physiological activity, iodine must first be split off from thyroxine, light being the liberating agent.

Repeated observations have been made upon the influence of season upon the incidence of goiter. Goiter is much less prevalent during the summer months than during the winter months.

There are reports in the literature which indicate that infections and various chemical substances are capable of inducing an increased bodily demand for iodine.

## IODINE REQUIREMENT

There exist wide differences of opinion as to the amount of iodine required by infants and children. It is probable that the conditions of requirement for iodine in the newborn and during early infancy are similar to those for iron. The thyroid gland grows and develops rapidly during early childhood and the physiological demands for iodine are therefore great. Von Fellenberg[21] estimates that for a child approximately 150 gamma are required, while 50 gamma are sufficient for an adult. It is probable that if organic iodine is administered, much less than the amount estimated by von Fellenberg will suffice to meet all physiological requirements.

The studies made by McClendon[22] on the passage of iodine into butter fat and thyroglobulin show that feeding inorganic iodine to cows leads to an enormous increase of iodine in the whey of their milk, but little in the butter fat; whereas, if cows receive feeds which are naturally high in iodine without the addition of the element, the ratio of iodine in the butter fat is higher than that in the skim milk. It is known that thyroglobulin from normal persons contains a high percentage of iodine. Feeding experiments made by McClendon, Waggenstein and Cavell, with patients with toxic goiter who, according to many authors, have no appreciable amount of iodine in the thyroid, are enlightening. The feeding of Lugol's solution led to the development of thyroglobulin containing a very small quantity of iodine, while ingestion of foods with a high iodine content led to a large amount of thyroglobulin in the thyroid. They conclude that iodine in food in natural combination which may be di-iodotyrosine, may behave differently in the body from inorganic iodine. Both Lunde and von Fellen-

berg[23] found that when inorganic iodine was fed to animals, almost the entire amount could be recovered in the urine within 24 hours; but when iodine was fed as it normally occurs in foods, the amount ingested could not be recovered over a period of several weeks. It appears from the work of Lunde[23] that the body stores iodine more readily when it is taken in the organic form as it occurs naturally in foods, and consequently the daily requirements are less than if inorganic iodine is taken. No inorganic iodine is found in the thyroid gland and little in the tissues. There is always an emergency store of iodine in the tissues when an ample amount is consumed in foods.

The goiter problem has not been solved in any of the goitrous areas in the world. The incidence of the disease has probably been reduced in some areas through the general use of iodized salt and other preparations of iodine administered in various ways. Conflicting opinions exist as to results obtained in Switzerland and Austria, where the so-called "full salt" is used, made by mixing 0.5 gram of potassium iodine with 100 kilograms of common salt. DeQuervain and Bircher,[24] among others, question the results obtained by Eggenberger[24] and others and have cautioned against the use of this prepared salt. They have cited instances in which harm has resulted from its use. Mussolini[25] is now making a test in a highly goitrous area in Italy in which he is using one gram of potassium iodide with 100 kilograms of common salt. He is using as a control the adjoining province, equally goitrous, in which the use of iodized salt is not permitted. In the United States, similar differences of opinion are held by men of high professional standing. Kimball[26] feels that much good has been accomplished through the use of iodized salt in Michigan. In 1929, Olesen,[27] of the United States Public Health Service, a man who has spent many years in the study of this problem, studied the results of the thyroid resurvey made by the same physicians who had made the original survey of four representative counties in Michigan under the supervision of Dr. Kimball. He reports that in every locality there had been an increase of endemic goiter over the original figures. Shortly after returning from Europe, where he had gone to study the goiter situation, Dr. Olesen[28] wrote that in his opinion iodized salt is neither harmful nor efficient and he presented strong evidence in support of his opinion.

In the course of this study we sought from various sources information that would enable us to arrive at an approximately correct estimate of the seriousness of the goiter problem in the United States. It soon became evident that we could not rely solely upon the surveys that had been made by the United States Public Health Service, state and local boards of health and individuals, because we found that it had been invariably the case that when two or more surveys had been made in the same community, each by different individuals, the results varied so greatly that it was difficult to reconcile them. Wide differences of opinion are held as to what constitutes a normal thyroid. In a section where goiter is rare, an examiner is likely to report an enlargement that would be considered normal in a section where the incidence is high. Therefore, we have in addition to these sources obtained information from the records of hospitals and other institutions and analytical studies of foods and feeds from various localities.

The most amazing results in a section that we assumed to be non-goitrous were from the parishes St. Charles, St. James, Washington and St. Tammany in Louisiana, reported by L. C. Scott.[20] He reports a goiter incidence as high as has thus far been reported from any section of the world. A careful resurvey by an experienced examiner would probably not sustain these figures.

By far the greatest number of cases of endemic goiter occur in children. The great number of mentally deficient and deaf mute children for whom admission is being sought in institutions in the goitrous areas of the United States is a problem for serious concern. From all such institutions from which information was sought, we were informed that they were already overcrowded, and that means for providing for the care of the inmates was inadequate and funds increasingly difficult to obtain. These children are a hopelessly dependent class. Their affliction is almost invariably permanent and treatment offers little or no hope.

There is another class of children who usually remain at home and are a source of solicitude to their families. This type has been recently well described by Dr. George Crile[30] in discussing cretins. He writes:

> "Moreover, in goitrous districts there are a large number of children whose physical and mental conditions are retarded by a low grade cretinism which is not pronounced enough to produce the characteristic symptoms. These cases are similar to cases of hypothyroidism."

These cases may be recognized by the heaviness of their features. They develop slowly, both physically and mentally. In families in which this type of case is found there will probably be later born an imbecile or an idiot.

An observation that is being made with increasing frequency by physicians residing in the goitrous areas deals with the comparatively large number of infants who at birth are so weak that they survive only a short time. This condition is spoken of by the physicians of the goitrous areas of Europe as thyrogenous debility.

We shall briefly summarize the effects of iodine and the iodine compounds. (1) Iodine supplies the most important element which enables the thyroid gland to synthesize thyroxine and all other secretions of that organ. (2) It increases the basal metabolic rate. (3) It regulates the rate and functions of glands and the system of glands in the body. (4) It stimulates growth and development and is essential for both. (5) It increases the strength and vitality of the newborn infant. (6) A sufficient amount of iodine is necessary to maintain calcium, phosphorus and magnesium balance. (7) A deficiency of iodine in the diet extending over a more or less long period gives rise to cretins, feeble-minded children, congenital idiots and in adults to myxedema. (8) It is not infrequently observed that children of goitrous mothers are undersized, develop slowly and are mentally subnormal.

McClendon reports that in Japan the incidence of goiter is one to one million of population. Seaweed (enormously rich in organically bound iodine) in some form enters into the daily diet of all classes of the people. In certain sections of the United States where it is known that the water and foods are rich in iodine, goiter and other manifestations of iodine deficiency is exceedingly rare.

We may, therefore, reasonably conclude that if the goiter problem is to be solved it will be through the medium of foods high in their iodine content. It may be of interest to mention in this connection that in our studies the iodine content of milk parallels the iodine content of vegetables in goitrous and non-goitrous regions. It was, however, discovered that milk may carry a much higher iodine content than does the average vegetable. As milk is the food upon which all young animals must depend, we are encouraged to believe that through this food the solution of the goiter problem will be found.

In 1930, the writer reported to the Pediatric Section of the American Medical Association a series of ash analyses of milk from points in the goitrous and non-goitrous regions of the United States. These analyses showed wide variations in all their mineral elements, but particularly in their iodine. The variations within the goitrous regions were striking, and there were much greater differences between the goitrous and non-goitrous areas. Samples of milk from the goitrous areas were so low in their iodine content that it would be impossible for the daily intake to provide sufficient iodine to meet nutritional requirements.

The fact that milk was variable in its mineral and vitamin content suggested the thought that by careful and scientific feeding of dairy cattle its usual great value as a food could be enhanced. The present study had as its chief purpose the obtaining of milk from mixed herds that contains a sufficient amount of iodine in its natural relationship to provide for all the body needs, regardless of residence or season or physical requirements.

We realized that such information as was desired could be obtained only by a patient and careful study of milk, both in the goitrous and non-goitrous regions, and that analyses of many samples of milk would be necessary if reliable information were to be obtained. It appeared equally important to know the feeds eaten by the dairy cattle and the analyses of each. Since seasonal variations in the incidence of goiter have been noted by practically all observers, it seemed desirable to ascertain the seasonal variation of the iodine content of the samples of milk. Therefore, it was decided to extend the analytical studies over a sufficient period of time to cover all seasons. This work has been done at the South Carolina Food Research Laboratory[31] in cooperation with the Dry Milk Company of New York. This company built and equipped an experimental milk drying plant at Newberry, South Carolina. It was of the roller process type and was operated by an experienced technician. The method of handling and drying was made to conform to that in usual commercial plants.

Eight collecting points were selected, two lying near the foothills of the Blue Ridge of the Appalachian Mountains, four in the rolling country below the Blue Ridge and the Coastal Plain, and two in the Coastal Plain. Milk was collected three times a week, collections being made in rotation. In selecting herds for the experiments it was specified that only cattle receiving home grown feeds were to be used in

the study. The first collection was made on October 26, 1931, the last on September 2, 1932. Four times during the course of the experiments, dairy specialists from the laboratory made a complete circuit, visiting every farmer and obtaining data as to his methods of feeding and collecting samples. The samples of all batches of milk powder were promptly sent to the laboratory and these were analyzed for iodine without further drying or manipulation. Inasmuch as the Karns technic offered advantages of rapid analysis and accuracy, this method was adopted.

### GENERAL RESULTS

The analytical work embraced 117 samples from the eight collecting points in South Carolina, nine samples during the same period taken from the regular run of the commercial dry milk plant at Bainbridge, New York, and six samples similarly obtained at Columbus, Wisconsin. We have no knowledge of the feeds from Bainbridge or Columbus nor their analyses, but no doubt iodized salt was fed, as it is the custom in that section of the country.

This phase of the study extended over a period of ten months. It was found that the batches showing the highest iodine value were from Abbeville, South Carolina, 1,170 parts per billion, and from Greenville, 1,872 parts per billion. Both were obtained between August 15 and September 2. The highest iodine value from Bainbridge, New York, was 392 parts per billion and was obtained in December. The highest from Columbus, Wisconsin, was 395 parts per billion and was obtained in April. It was also learned that from the Abbeville and Greenville localities milk could readily be obtained throughout the year that would run from 800 to 1,200 parts of iodine per billion, from cattle fed locally from feeds. Each ounce of this milk when dried contains from 12½ to 20 gamma of iodine. It is therefore probable that if this milk is fed in ordinarily prescribed proportions a child will receive all the iodine necessary to meet nutritional requirements. However, had we considered it necessary we could have used milk whose iodine content would have yielded 25 gamma per ounce of dry milk, without occasioning any fear of producing iodism, since it is well known that a large amount of iodine, if it is in its organic relation, is not toxic. The iodine in the milk is in its organic relation and the maximum physiologic effects should promptly manifest themselves, because evidently the factor or factors that are responsible for the utilization of iodine by the body should be present in this milk. This assertion is based upon the observation that in the localities in which this milk is produced, infants and children do not manifest symptoms that are suggestive of iodine deficiency and in others where the proportion of iodine is low, they do.

After satisfying myself that we had succeeded in producing a milk that, according to the accepted standards, contained the various elements, with the possible exception of iron, necessary to meet the requirements of nutrition, a group of outstanding pediatricians was organized, who had at their command facilities for conducting careful feeding experiments. Most of the members of this group resided in sections where the incidence of goiter was reported to be high. They were asked to conduct feeding experiments with children of all ages, using milk in the quantity previously suggested and selecting an equal number of control cases, fed upon any other milk and ascertain: (1) the rate of growth and development; (2) the hemoglobin rate; (3) in children of goitrous families or in those with enlarged thyroid, manifest debility, slow gain in weight and retarded development, prematures, twins, triplets and other cases that present feeding and developmental problems.

We have a sufficient number of reports to reach some conclusions. The summary of results reported was as follows:

(1) In nearly all cases growth and development have proceeded at a more rapid and regular rate in children who received milk of high iodine content than in the controls.

(2) A fairly high hemoglobin has been maintained in prematures, twins and triplets.

(3) Weight has increased upon a more normal scale, that is, without variations or interruptions, than in the controls.

(4) Among groups of children who have habitually vomited, all but one case reported was favorable.

(5) Cases of debility, slow development, failure to gain in weight or abnormally slow gain (non-syphilitic) when fed this milk showed marked and steady improvement. No cases were reported that developed enlarged thyroid gland or any other manifestation suggestive of iodine deficiency.

(6) A few physicians reported having fed this milk to children with beginning thyroid enlargement with satisfactory results.

(7) In cases where calcium and phosphorus values were studied it appears that a positive calcium-phosphorus balance was maintained.

In view of the fact that irradiation has been demonstrated to exercise an important influence in the utilization of iodine, iron, calcium, phosphorus and magnesium, it is probable that irradiation of this milk would increase and broaden its field of usefulness.

We must conclude from the investigations thus far made that milk of naturally high iodine value offers the solution of the goiter problem in children.

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## DISCUSSION (*Abstract*)

*Dr. St. Geo. T. Grinnan, Richmond, Va.*—Recent examination of the James River water shows that the James River has an ample supply of iodine. The James River supplies Richmond. Thus the iodine question in Richmond is answered.

*Dr. Weston (closing).*—We may draw valuable conclusions from results obtained by the Japanese in the solution of the goiter problem.

McClendon reports that the incidence of goiter in Japan is one to one million of population and that seaweed, a substance which is enormously rich in organic iodine, enters into the diet of practically every Japanese individual. It appears that there are various receipts by which seaweed may be supplied in edible form. We are also informed that large amounts of seafish are consumed by the Japanese and that this is an additional source of organic iodine.

We conclude that from the standpoint of the young American, milk from specially selected areas in which the iodine content is relatively enormously high is probably the logical solution of goiter in this country. This source of organic iodine, however, may be largely supplemented from certain vegetables and fruits grown in selected areas where analyses have shown the iodine content to be high.

## PSYCHOPATHIC PERSONALITY: MEDICOLEGAL ASPECTS*

*By* CHARLES A. MCKENDREE, M.D., F.A.C.P., New York, New York

In approaching this subject, I have purposely refrained from using the term "constitutional psychopathic inferiority," because I am not certain that all psychopaths behave as they do because of an anlage that predisposes toward such behavior. Regardless of my own personal experience that justifies the concept of inherited predisposition, my mind is entirely open to the theories and teachings of all schools of thought that are rational and helpful in adjusting psychopaths to a more adequate and a happier life.

Therefore, I have used the term "psychopathic personality" as a fundamental basis upon which we can all agree. One may well ask, "what is psychopathic personality?" when we are living, working, and enjoying ourselves in a world of psychopaths, some of whom constitute the most intelligent, cultured, and most worthwhile individuals in our community. As Glueck says:

"No child comes into life with an absolutely clean slate upon which one may write at will his destiny. The child is born with certain predispositions and racially established tendencies that modify his situation in various directions."

I deal exclusively in this paper with psychopathic personalities that manifest anti-social behavior, that are dangerous elements in the home and community. I have eliminated from this discussion individuals who have psychotic trends consisting of continuous or episodic deviations from the average individual's life reaction. I deal with those individuals that fail to meet the demands of their environment; that do not meet the social demands of "honesty, decency,

*Read in Section on Neurology and Psychiatry, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

or consideration for others:" the emotionally unstable individuals who show poor judgment, do not profit by experience, and are constantly deviating into one course or another that brings them into conflict with society and the law. They may recognize the consequences of their acts intellectually, but do not, and will not, evaluate the results of their behavior in accordance with our conventional and traditional standards of living. The type does not include morons, feeble-minded, or frankly psychotic individuals.

The various types of delinquency, alcoholism, drug addiction, true aberrations of the sexual instinct, assaultiveness, self-destruction, robbery, forgery, racketeering, vagrancy, prostitution, and many other forms of deviations, in many instances, may well fall within this group.

We are much in the same position with psychopathic personalities that we are with some of the affective types of psychoses as far as clinical therapy is concerned. Adjustments may be obtained, recoveries may occur, and recurring conflicts may be seen even with the best environmental, medical, psychological and other types of therapy.

We all agree with Kraepelin that one may be psychopathic and yet not allow his actions to be psychopathically determined. We all agree that environmental situations as well as the anlage may precipitate psychopathic episodes and periods.[1]

No one can deny the correctness of Jelliffe's statement that the human body is not a closed system and any adequate understanding as to what happens and has happened must include the outside as well as the inside relationship.[12]

Collins once said:

"The prophet Ezekiel was assured that he would have no more occasion to use the proverb, 'the fathers have eaten sour grapes and the children's teeth are set on edge,' but neurologists and psychiatrists still have to use it, because experience teaches them that man is what he is because his progenitors were what they were."[13]

No unprejudiced mind can deny the great contributions of Freud, his followers, some former Freudians who have strayed into bypaths, and the individual psychologists. With Freud came an analysis of psychopathic personalities that permitted an approach from the subjective communications of the patient, to seek the significance of these productions for the personality and behavior.[1] The idea and the mechanism of repression has been quite well accepted amongst fair minded clinicians. However, it seems to me that there is no more fertile soil than that furnished by psychopathic personalities for the production of conscious as well as subconscious material that can easily be misconstrued and misinterpreted in the mind of the imaginative analyst.

There is no question that analysis brings out important points in the psychopath, just as it does in those who consider themselves well adjusted, and there is no one more ready to accept an alibi than the psychopath. It is debatable how fundamentally operative the idea of child-parent fixation is in the type of psychopaths under consideration. And furthermore I consider it debatable how far the idea of sex in its broadest connotation can be intercolated with the psychic make-up of such individuals.

It may well be that the sense of inferiority, inadequacy, even lack of object libido or fixation upon the Oedipus situation and organ inferiority may be involved in the whole problem. My mind is not closed to the Alderian concept that psychopathic manifestations are merely normal reactions to a pernicious milieu, if the concept is confined to certain groups or types of individuals.

Kahn reiterates the statement that the psychopath fundamentally considers himself important and is excessively occupied with his own ego.[1] Certainly, preoccupation with the ego, according to the character personality of the psychopath comes into purposive relation with power, prestige, ego protection and ego searching. Evidences of this are manifest even with superficial knowledge of the lives of some of our most notorious anti-social personalities. It is unquestionable that changes in mood, excitability and affective tone are present in many.

"Ultimately, the purposes and set goals of character must be derived from the attitude of the super ego toward the ego and toward the environment, or else from the interaction of these two attitudes" (Kahn).

Psychopathic personalities are potentially reactive to all sorts of stimuli; economic stress, insecurity, discouragement, sexual maladjustments or repressions, envy, jealousy, love, or the striving for prestige. Character, as we define it broadly, may be exemplary, up to the time of the anti-social behavior, and it may be exemplary also between episodes of dangerous anti-social outbreaks. Genius for philanthropic endeavor, genius in intellectual and artistic pursuits, and the highest moral tone, may exist in an individual, potentially liable to anti-social behavior. In normal times, insight curbs the underlying character or personality defect.

The first and pre-eminent method of treating

the criminal is by preventing the development of these types.

Proper mating stands out first as a very forceful method of attack. But we are not yet able or ready or sufficiently educated as a nation, made up of many races and varying temperaments, to accept more than advice, lectures and the various efforts of the splendidly organized mental hygiene movement. The intellect is not constantly subservient to the emotional life of men and women, by and large, and perhaps we are glad that it is not.

The second method of attack should be more and more directed toward the psychopathic child. Regardless of types, endocrinological, physical or biochemical, the home, particularly the parents, and the environment should receive, and are receiving more and more attention from all medical, social and legal agencies. The splendid pioneer work that is being done at the State Training School for Delinquent Boys at Warwick, New York, exemplifies the far-sighted project of reaching children early in their psychopathic behavior in a very comprehensive way. Just as in internal medicine preventive work has made remarkable progress, so in psychopathology thorough studies are being made by groups everywhere in this country and in Europe to prevent psychopathic children from becoming psychopathic adults.

It is of the most profound significance that in our country, and particularly in the great cities, crime has its roots deeply planted in childhood.

Everywhere it is recognized that the problem child is a potential problem adult. Sometimes the behavior may seem of slight consequence, as indeed it may prove to be, but as a rule, delinquencies in children should receive very serious attention. No one in this group needs to be reminded of the splendid effort in this direction made by Healy, Salmon, Birnbaum, Glueck, White, and others.

We are all aware of the fact that reformatories, in general, have not served their purpose, but on the contrary, have served to herd together anti-social beings without adequate study, personal service, direction or training. They have not served to teach the young the spiritual values of life, nor to give them sufficient insight into the reasons why they behaved as they did, and a true understanding as to why living like the average individual is more worthwhile.

The work with delinquent children must go forward as one of our major projects, and the future years will show results well worth the backing of state and private funds established for that specific purpose.

But we have before us the most perplexing problem of what to do with psychopathic adults. In the past ten or fifteen years, law and medicine have established closer points of contact. Magistrates, district attorneys, judges and social agencies are striving eagerly to understand the nature of these problems from the medical point of view, and at the same time striving to serve the community by protecting it from dangerous individuals and influences. There is no real fundamental basis for conflict between law and medicine, as long as political influence is removed from the scene, and as long as medical experts do not conflict with each other in courts of law. The penal law has as one of its implied duties the study of the nature of the offender, and the problem of the direction of human desire and action, as well as the so-called administration of justice. But in many instances desire for personal satisfaction and public approval, and compensated medical opinions, prevent what I consider just and unbiased study, disposition or care of anti-social, mentally sick individuals.

We must all realize that there are more dangerous people at large than are confined in penal institutions. We all know only too well that more dangerous psychotic individuals dwell in our midst than are committed to state and private hospitals. We know the reasons for this: that the families and the communities are not yet sufficiently educated to the nature and demands of mental illness to grant physicians and hospitals the proper power to care for the sick. And in all strata of society there are no more obstinate and shrewd persons than the psychopathic types who would break their way into prison rather than be committed to hospitals, regardless of the ultimate effect upon themselves and their families. And even when committed by due process of law, through the power of habeas corpus and the lack of understanding of juries, their release is many times effected to the danger of the community.

The legal profession is beginning to understand the nature of these problems. Justice Holmes once said that in substance the growth of the law is legislative, that the secret root

from which the law draws all the juices of life is consideration of what is expedient for the community concerned, the more or less definitely understood views of public policy.[15]

The American Bar Association has placed itself on record as approving the scientific treatment of criminals as a basis for law enforcement. They know that experts should be employed to pass on all possible mental disorders in criminal and juvenile courts, and in penal and correctional institutions. They even advise the filing of psychiatric reports in felony cases.[11]

Therefore it would seem advisable to set up machinery in every state, county and municipality whereby every delinquent or criminal should be examined by impartial experts agreed upon by both parties concerned. Such experts should spend sufficient time in each case to determine the problem from the psychiatric standpoint, and not allow themselves to be drawn into the playground of new nomenclature and fanciful jargon in an endeavor to establish the question of responsibility and freedom of the will. Too often experts spend the most of their time trying to determine and convince the juries and judges that the accused does or does not understand the nature of his act and the consequences thereof, when we know as a body that in most psychopathic individuals, such as I am describing, that question is not of paramount importance. What we want to know is the motivation underlying the act; the offense, however trivial, is secondary.

Every day we learn of new cases brought to justice, the products of so-called reformatories, of the present parole and pardon system, graduates of one or many prisons, repeating their old or new offenses, defiant, bitter, threatening, and organized against society. We know the futility and actual evil of short sentences, allowing no chance to do any good with plenty of chance for evil consequences and a breaking down of deterring influences. Punishment as such does not deter.

I believe that a set-up for the study, treatment, and hospital custodial care of the anti-social psychopath would result ultimately in the restoration of some individuals, the permanent segregation of others, and incidentally in an ultimate saving of money to the communities involved.

My recommendations are not new. They are drawn from various sources, indicated in the references. They are based upon the experience of both legal and medical minds that have been earnestly and vigorously trying to bring about some effective action and results in these cases. They are as follows:

(1) There should be established in every juvenile and criminal court a real, effective, impartial, non-political psychiatric service to assist the magistrates and judges in arriving at a conclusion as to the make-up and disposition of each offender. Such a service would be eminently more practical than expert testimony.

(2) No offender should be sentenced for felony in which the judge has any discretion until there has been filed a complete psychiatric report as part of the record.

(3) There should be a psychiatric service available to every penal and correctional institution.

(4) A psychiatric report should be made on every prisoner convicted of a felony before he is released.

(5) There should be established in each state a complete system of administration, transfer and parole, and there should be no decision for or against any parole or transfer from one institution to another without a thorough psychiatric study.

(6) There should be established not more penal institutions, but more adequate facilities for study of the criminal, preferably in state or county hospitals. These facilities should provide for complete physical, glandular, psychiatric, neurological, past history, heredity, and environmental studies.

(7) The length of time necessary to cure or segregate the offender is not a function of the court, but should be left to the opinion of competent psychiatrists.

(8) The indeterminate sentence is the necessary consequence of the individualization of discipline and one of the most efficacious means of social defense, at the same time, providing for adequately prolonged study.

(9) Psychopaths should be discharged only on parole, subject to recall, no parole to be granted without a complete and competent examination with a statement of the reasons justifying such discharge or parole.

(10) Permanent legal detention is necessary for incurable, inadequate, incompetent anti-social

persons, regardless of the special offense for which they are committed.

(11) The assets of the permanently custodial group within the hospital environment should be developed for the benefit of the community by which these individuals are maintained.

(12) Punishment from the motive of vengeance should be eliminated, and rigid discipline be used for definite constructive ends for conditioning conduct.

(13) Prisons should gradually be transformed into laboratories for the study of human behavior and the conditioning of human conduct.

(14) District attorneys and judges of criminal courts should have had as a prerequisite for their appointment or election an association with a psychiatric clinic or prison for at least one year.

(15) Separate buildings in conjunction with state or county psychiatric hospitals should be constructed and maintained for the adequate control of psychopaths.

(16) Finally, psychopathic personalities should be regarded by the law with the same consideration that affective and organic psychoses are regarded, and more teeth should be put in the commitment laws, so that in private as well as public institutions, prolonged care may be made possible.

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## RUPTURE OF THE KIDNEY PELVIS: REPORT OF THREE CASES*

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Rupture of the kidney pelvis is a relatively rare condition. The author has collected 61 cases of rupture of the kidney pelvis from the literature and has added three personal cases. In this series, 31 were of the traumatic type, 26 of the spontaneous type, 4 occurred after pyelography, and 3 followed instrumentation of the ureter. It is possible and, indeed, very probable, that many more similar cases have been encountered, but have not been reported or are reported in connection with some other renal lesion, for example, ruptured hydronephrosis, or reno-colic fistula, and hence are not readily discernible in the rapidly increasing urological literature.

The above series includes only those cases in which the rupture is strictly confined to the pelvis of the kidney and excludes those in which the rupture has occurred at a terminal calyx or in which an associated rupture has occurred in the renal parenchyma, which is of sufficient importance and severity to overshadow or mask the pelvic rupture.

True rupture of the kidney pelvis may be conveniently classified into the following two types: (a) traumatic, and (b) non-traumatic or spontaneous.

The traumatic type of ruptured pelvis may occur in a congenitally normal kidney or in a kidney which is the seat of an acute or chronic pyelonephritis or a congenital or acquired hydronephrosis. The rupture is usually the result of direct or indirect trauma exerted against the kidney in such a manner that the physiologically or pathologically distended pelvis is jammed against the lower ribs or the transverse processes of the upper lumbar vertebrae. The rupture is usually linear and radial in character. Occasionally the pelvis or the ureter at the ureteropelvic junction may be partially or completely avulsed. The degree of external violence varies from a crushing injury or direct blow in cases

*Read in Section on Urology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

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*Abstract of longer article. This paper is one of a symposium of five papers on urological accidents. The remaining papers and the discussion will appear subsequently in the Journal.

of rupture of a congenitally normal kidney to mild muscular effort in cases of rupture of the pelvis of a hydronephrotic kidney.

The spontaneous type of pelvic rupture occurs only in a kidney whose pelvis has been pathologically weakened by a chronic pyelonephritic process or by hydronephrosis. The most common type of spontaneous rupture is the rupture of the pelvis of a hydronephrotic kidney secondary to an obstruction of the ureter or pelvis by a calculus. The rupture usually occurs as the result of a sudden or gradual alteration in the increased back pressure exerted upon a pathologically weakened pelvis. Other types of spontaneous rupture are: (1) perforation of the pelvis as a result of pressure necrosis from an impacted calculus; (2) perforation of the pelvis by a ureteral catheter or metallic ureteral instrument; (3) rupture following the exertion of increased pressure in the syringe method of pyelography; (4) rupture of the pelvis following a plastic operation on the pelvis; and (5) perforation of the pelvis as a result of chemical necrosis following the injection of a strong alkali or other irritant by mistake during pyelography or renal lavage.

The traumatic type of ruptured pelvis has a greater incidence than the spontaneous type. The traumatic type apparently occurs with greater frequency among the males which may be due to the fact that males are subjected to greater hazards in this age of highly mechanical industries, automotive travel and competitive sports. The spontaneous type occurs with about equal frequency in both sexes. The traumatic type may have a greater incidence in children because of the increased susceptibility in childhood of a pathologically weakened pelvis to rupture following mild traumata.

The most striking pathological feature of ruptured pelvis is the extravasation of urine into the surrounding tissues. This condition is rarely accompanied by the extravasation of blood. When the actual amount of urine escaping through the pelvic rupture or perforation is scant and the urine sterile, the tissue reaction is prompt, and localization and absorption of the extravasate may ensue with or without the subsequent formation of a circumscribed abscess in the peripelvic or perirenal tissues. When the extravasation of urine is more extensive or continues for some period of time after the rupture, the tissue reaction may be less efficient, particularly if the urine contains pathogenic organisms. In such a case, the extravasated urine causes a diffuse inflammation in the surrounding tissues which soon results in suppuration and a rapidly progressive perirenal abscess. Occasionally, the perirenal abscess may rupture into the lung (Mathe), large bowel (Wesson), peritoneal cavity or externally into the skin of the loin, giving rise to the formation of a temporary or permanent fistula (Mathe, Turner, and author).

There is no definite symptom complex or clinical syndrome that is absolutely typical or constantly associated with rupture of the pelvis. From a clinical standpoint, ruptures of the pelvis may be divided into an acute and chronic form. The acute group includes those cases of sudden rupture secondary to trauma. The patients appear to be acutely ill as a result of the immediate urinary infiltration of the perirenal tissues. Suppuration and abscess formation rapidly progress and the patient develops a severe toxemia and occasionally passes into a state of shock which may precipitate a complete collapse and even terminate fatally. In the chronic type, a perforation of the pelvis may proceed slowly as a result of pressure necrosis from an impacted stone or from the effect of increased intrapelvic pressure on an inflamed or ulcerated pelvis. In such cases the urine is released slowly into the perirenal tissue and a well walled off perirenal abscess may form with the gradual development of a mass in the renal region. Occasionally the abscess may spread downward into the iliac fossa, upward around the liver or below the diaphragm or outward into the skin. Symptoms of shock and collapse are usually absent in the chronic form.

The urologist should suspect a rupture of the pelvis if the patient gives an antecedent history of a chronic pyelonephritis or a hydronephrosis secondary to a ureteral or pelvic calculus and presents the following train of symptoms: sudden sharp pain in the renal region followed by a sudden or gradual swelling or mass in the same area, accompanied by chills, fever, nausea, vomiting, and frequently shock or collapse.

The clinical impression of ruptured pelvis should always be confirmed or substantiated by a thorough urological study, including pyelography, since this is the only dependable method of diagnosis. The advantages of the gravity method of pyelography and Wesson's combined method of intravenous urography and ureteral catheterization and the dangers of syringe pressure pyelography cannot be too strongly emphasized. In the extremely toxic and debilitated patients, retrograde pyelography is contraindicated, but intravenous pyelography can be sub-

stituted without fear of producing any unpleasant symptoms or complications. The introduction of the latter method of pyelography should greatly increase the number of cases correctly diagnosed.

Successful treatment in cases of ruptured pelvis is directly dependent upon an early diagnosis and immediate surgical intervention. The ultimate choice of the operative procedure can be made only at the time of operation and must take into consideration the general condition of the patient, the pathological condition of the kidney as seen at operation, and the extent of the extravasation of urine or the suppurative process in the perirenal space.

Treatment may be either conservative or radical. The conservative procedure is essentially incision and drainage and, if possible, correction of the pathological processes responsible for the rupture and repair of the pelvic laceration. This type of treatment is not always feasible or advisable. The radical procedure is nephrectomy, if the opposite kidney is healthy. In the final analysis this form of treatment may prove to be most conservative from the standpoint of saving the life of the patient, eliminating the cause of the extravasation, shortening the period of convalescence, and preventing postoperative complications, such as fistula, atrophy, nephritis, abscess or stone formation. In the very toxic and debilitated patients and in patients with evidence of bilateral renal disease, treatment should be carried out in two stages: (a) preliminary incision and drainage, and (b) secondary nephrectomy or conservative repair. This plan of therapy serves to control the perirenal suppuration by preliminary incision and drainage, enables the patient to recover before the secondary operation is performed, and permits the urologist to study the patient thoroughly during the convalescence and plan the operative procedure necessary to correct or remove the causative lesion.

*Case 1.*—M. M., a man 77 years of age, an inmate of the Aged Home, was admitted to the hospital on May 6, 1932, with the complaint of pain in his left kidney region. He had had a bilateral ligation of the vas deferens and a perineal prostatectomy one year previously, with an excellent functional result. Four weeks before admission to the hospital the patient developed a sudden sharp pain in his left lumbar region radiating to the groin. The pain persisted for several hours and was accompanied by nausea, vomiting and fever. A dull pain persisted in the left lumbar region and left upper quadrant after the first attack. The patient gave a history of nocturia 2 to 3 times, burning, hesitancy, and urgency, but no history of passing a calculus or hematuria, and no history of trauma. For the preceding two months there had been a progressive loss of weight and strength.

Physical examination was negative except for definite fullness in the left upper quadrant extending from the left flank to the mid-epigastrium. The muscles in this area were spastic. A mass about the size of a large orange was felt and appeared to be smooth and tender to touch. There was no ballottement or fluctuation. There was tenderness in the left costo-vertebral angle. The leukocyte count was 10,000 with 86 per cent polymorphonuclears. The urine showed 20 to 30 pus cells per high power field.

On admission to the hospital the patient ran an elevated temperature for four days. Cystoscopy and pyelography were then performed. Two small calculi in the bladder were seen and removed by a rongeur. Pyelogram of the left kidney showed extravasation of dye around the pelvis of the kidney. The pelvis and calyces appeared to be dilated. A diagnosis of a left pyonephrosis with a perinephritic abscess due to rupture of the pelvis was made. In view of the fact that the patient's condition was good, he was kept under observation for several days, but as he continued to show a slight daily elevation in temperature and the mass appeared to be increasing in size and became more tender on palpation, operative intervention was decided upon. Fourteen days after his admission to the hospital a subcapsular nephrectomy was performed under spinal anesthesia. The abscess contained approximately three ounces of a thick, green, foul-smelling pus and was found on the posterior aspect of the lower pole of the kidney. It appeared to extend around anteriorly to the region of the pelvis. Two perforations were noted in the region of the ureteropelvic junction. Culture of the pus from the abscess revealed *B. pyocyaneus*. The patient had a stormy convalescence for the first few weeks after operation. The wound broke down and the patient developed furuncles in the left lumbar region culminating in a fairly large carbuncle which responded slowly to treatment. He was discharged from the hospital 34 days after operation in good condition with the wound entirely healed except for a small sinus tract which healed two weeks later.

Pathological examination showed the usual changes of arteriosclerosis and pyonephrosis. The ureter was constricted at the ureteropelvic junction. Above this point of constriction, there was a small perforation 3 mm. in diameter and below this point of constriction were two small perforations measuring 3 mm. in diameter and 2 mm. in diameter, respectively.

It is difficult to determine the etiological factor responsible for the perforations of the pelvis and ureter in this case. It is the author's opinion that the essential pathological changes present in the affected kidney, that is, pyonephrosis, pyelonephritis, and stricture of the ureteropelvic junction were secondary to the benign prostatic enlargement which was removed one year before. The perforations on the pelvis were probably the result of increased back pressure beyond the stricture at the ureteropelvic junction. It is difficult to explain the development of the perforations below the ureteropelvic junction unless these perforations are the result of an attempt

of extravasated urine and pus to drain back into the ureter.

*Case 2.*—K. Z., 53 years of age, a housewife, was admitted to the hospital June 22, 1933, with the complaint of pain in the left upper quadrant. The patient gave a history of kidney colic on the left side in 1926. She subsequently developed kidney colic on the opposite side in 1928. From 1926 to 1933 she received about 75 cystoscopic treatments in the form of bilateral ureteral dilatations and pelvic lavages at intervals of two to four weeks. In March, 1928, a right nephrolithotomy was performed. A large calculus was observed occupying the lower and larger half of a double kidney on the left side. There was an incomplete duplication of the ureter on the left side with bifurcation at the middle and upper third of the ureter. Operative removal of the left renal calculus was deemed inadvisable because of the marked infection present in both kidneys and the reduced renal function in each kidney.

For the preceding year the patient had complained of a dull persistent pain in the left upper quadrant. The pain had been rather sharp, had radiated along the course of the left ureter, and had gradually increased in severity. The urine had been very cloudy and at times blood-tinged. The patient complained of frequency, every 2 hours during the day, and nocturia 1 to 3 times, burning on urination, urgency and tenesmus.

For the previous two weeks the patient had been confined to bed because of marked weakness and severe pain in the left upper quadrant. She also complained of chills, fever, nausea and vomiting. The urinary symptoms increased in severity. She noticed a swelling of the left upper quadrant for the previous two weeks, which gradually increased in size. She was treated by her family physician during this time. During the previous two years there had been signs of cardiac decomposition. She was also troubled with abdominal distension, flatulency, eructation and constipation.

On examination the patient appeared to be acutely ill and very toxic. There were no evidences of shock or collapse. Cardiac findings were those of mitral insufficiency and arteriosclerotic heart disease. There was a swelling in the left upper quadrant with spasticity and rigidity of the overlying muscles. It was impossible to outline a definite mass in this area. There was exquisite tenderness in the left upper quadrant, left loin and left lumbar region.

The urine gave a strongly positive test for albumin and microscopically showed a large number of pus cells, an occasional red blood cell, granular casts and organisms which proved to be *B. coli*. The leukocyte count was 9,400 with 78 per cent polymorphonuclears. The blood urea was 70.70 mg. per cent. Intravenous 'phthalein was reported as 10 per cent for the first hour and 15 per cent for the second hour.

The impression was that we were dealing with an acute exacerbation of a calculous pyonephrosis involving the lower half of the left double kidney. The signs and symptoms pointed to the presence of an accompanying perinephritic abscess on the left side. Due to the fact that the patient appeared to be critically ill, cystoscopic and pyelographic studies were not carried out. Immediate operation was advised upon admission to the hospital, but the family refused permission until ten days after admission, when the patient appeared to be moribund. She was given a preoperative transfusion of 500 c. c. of citrated blood. Ten days after admission to the hospital an exploratory lumbar incision was made under spinal anesthesia and a large perinephritic abscess was found surrounding the entire kidney and containing about three quarts of a thick, greenish pus which on culture was reported as *B. coli*. The abscess extended up to the diaphragm and down to the pelvic brim, but had not broken its way through the overlying muscles. Extensive drainage of the abscess area was provided. Due to the poor condition of the patient, it was decided not to explore the kidney or to attempt to remove the kidney. Following the operation, the patient appeared to rally somewhat, but on the third postoperative day became stuporous and semicomatose and died the following morning.

A partial autopsy was performed, which disclosed a double kidney on the left side with an incomplete duplication of the ureter. The upper supernumerary segment of the double kidney appeared to be relatively normal on gross examination and cross section. The lower segment was a massive multilocular pyonephrosis. The pelvis of the lower segment was covered with a large amount of fibrolipomatous tissue which was diffusely inflamed. At a point in the posterior surface of the pelvis corresponding to the mid-portion of the lower segment there was found a perforation from which a thick greenish pus exuded. On cross section of the lower segment there was a large branched calculus occupying the extrarenal portion of the pelvis of this segment. There was an area of necrosis about the perforation. The right kidney was of the hypoplastic type and showed arteriosclerotic changes.

The etiological factor responsible for the perirenal suppuration was a perforation of the chronic inflamed pelvis by a large irregular calculus. In our review of the literature we have not found a similar case of perforation of the wall of the pelvis of one segment of a double kidney. Undoubtedly, the prognosis in this case would have been more favorable if the condition had been recognized early and drainage of the abscess instituted immediately. The lack of cooperation on the part of the patient's family in consenting to an operation also contributed considerably to the fatal outcome in this case.

*Case 3.*—J. P., 52 years of age, married, a merchant, was admitted to the hospital on May 28, 1932, with the complaint of pain in the left abdomen. The family history was negative. The past history was negative except for a chronic gastro-intestinal complaint for the previous ten years in the form of attacks of cramp-like pain in the left lower quadrant. The patient was admitted to the hospital for a thorough study and during the course of the examination was found to have some pus and red blood cells in his urine. He gave a history of occasional diurnal frequency, every 1 to 1½ hours, and nocturia, 1 to 2 times, hesitancy and occasional burning on urination. There was no history of hematuria or renal colic.

Physical examination was essentially negative except

for slight tenderness in the left upper quadrant over the left kidney. A positive left ureteral point was present. The prostate was of normal size, but soft and boggy throughout.

A complete urological study was undertaken and disclosed: (1) median bar formation; and (2) left hydronephrosis, third degree, infected and non-functioning. A plastic operation on the pelvis of the left kidney was performed under spinal anesthesia, an elliptical piece of tissue was removed from the superior and inferior aspect of the pelvis, and a Heinecke-Mikulicz repair was done at the ureteropelvic junction.

The patient made an uneventful recovery. A postoperative cystoscopic and pyelographic study was made about one month after operation and revealed a marked reduction in the size of the left hydronephrosis with a definite restoration of function in this kidney. Following the discharge from the hospital, the patient was in excellent condition and gained ten pounds in weight. Eighty days after operation he developed a sudden pain in his left loin followed by a chill, nausea, vomiting and fever. Some relief was obtained by an application of heat to his left loin. Four days later he had another chill and was seen for the first time following the operation. At this time an area of fluctuation was noticed in the upper angle of his incision. There was tenderness in this area. There was no history of trauma. A tentative diagnosis of rupture of the pelvis with extravasation of urine was made and the patient was sent into the hospital.

Cystoscopic examination revealed dilatation of the left pelvis with an extravasation of dye outside the kidney pelvis. Ninety-three days after the previous plastic operation on the pelvis, incision and drainage was performed at the site of the old sinus tract and 50 c. c. of a foul-smelling sero-sanguinous material escaped. Three days later a left nephrectomy was performed under spinal anesthesia. The patient made an uneventful recovery and was discharged from the hospital on October 16, 1932, with the wound entirely healed.

Examination of the left kidney showed diffuse pyelonephritic involvement of the kidney substance with a diffuse cortical abscess formation, also a marked perinephritis was present. At the ureteropelvic junction, which was the site of the Heinecke-Mikulicz repair, there was a very marked narrowing of the mucosa, producing almost complete obstruction. There was a perforation in the line of the suture.

The cause of the perirenal extravasation of urine in this case was the failure of the suture line to hold following plastic repair of the stricture at the ureteropelvic junction and the development of a postoperative stricture and subsequent perforation at this point. Obviously, the suture line held for a short time after operation, for a pyelographic study performed 35 days after operation showed no extravasation of dye. However, it is possible that the suture line was weakened as a result of the postoperative pyelographic study undertaken to check the result of the operation. Intravenous urography for this purpose should preferably have been employed.

## THE SURGICAL TREATMENT OF GLAUCOMA*

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It is not intended in this short paper to enter into a discussion of the etiology of glaucoma, or to discuss at length any of the numerous theories which have already been advanced as to its cause. It is my purpose to present clinical observations and experiences.

Much is known about the causes of changing intraocular pressure; much of the knowledge, it would seem, is empirical and one is often at a loss to explain the end-results obtained, either good or bad, from treatment.

I wish to present some opinions acquired in a fairly large ophthalmic practice extending over a period of forty years. I am convinced that the index of an oculist's ability is reflected in the number of potential glaucoma cases found in his practice. Careful observers differ in their estimates as to the percentage of cases of increased pressure found in routine examinations, giving it between 4 and 6 per cent. I believe it to be much higher, probably nearer 10 per cent.

There are, of course, several types of glaucoma, and a hard eyeball is the end-result of a syndrome and not a cause of disease. I am of the opinion all glaucoma is due to an imbalance of the sympathetic nervous system. It is definitely recognized that tension fluctuates in normal eyes, due to excitement, grief, anger, loss of sleep or menstruation. This is not pathological, but a temporary disturbance produced by changes in the general circulation, though it is perfectly logical to conclude that prolonged disturbance of circulation could result in a pathologic condition. An eye that is anatomically predisposed would be more prone to obstruction from any cause.

Much of the confusion in operations upon glaucomatous eyes comes from the term "canal of Schlemm." The principle of all operations is the establishment of circulation in this canal through a filtrating scar. We fail to remember that this is not a canal at all, but a system of canals that connect with each other. I like to visualize this structure as a stream with many branches, filled with driftwood, and to wonder

*Read in Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

at the fallacy of expecting a cure by removing the driftwood from only one branch, which is all we do when we perform a trephine, basal iridectomy, La Grange, or any operation upon the uveal tract with the idea of producing a filtering wound. I have long been convinced of the fallacy of the filtering scar. If we examine our case histories and check up on our end-results, its futility will be seen.

Cyclodialysis more nearly meets the fundamental principles which we have been taught to try to fulfill. It separates the iris base from its adhesions, covering the pectinate ligament and the spaces of Fontana.

As I have said, I believe that all glaucoma is the result of a disturbance of the sympathetic nervous system. The end-result is the formation of a viscid exudate in the iris angle, due to a change of circulation which disturbs, what for want of a better term, we shall call osmotic pressure. According to Duke-Elder, the lymphatic drainage of the eye is a filtrate from the ciliary vessels and when it is pathologically altered it will clot and interfere with drainage. This view, I believe, is becoming generally accepted.

With your permission I call attention to the well known course of the flow of the aqueous from the ciliary body through the pupil, into the anterior chamber, through the spaces of Fontana, into the canal of Schlemm, and out through the anterior ciliary veins. We must keep in mind a posterior drainage through the lymph spaces, backward into the canal of Petit, and out through the lymphatics near the optic nerve. Operation should be to restore natural drainage, not to produce a vicious cycle.

It has been my observation that anything that will change the character or flow of the blood stream will predispose to glaucoma; not only a pollution of the blood stream from focal infection from any source at all, but also a nervous irritation which changes normal circulation can and does produce disturbance in the iris angle. I make this statement after long clinical observation. My observation has been that disturbance in the pelvis is more prone to cause this reflex than disturbance in any other part of the body. Seventy-five per cent of my cases were suffering from pelvic infection or irritation.

If you will go into the history of your cases, you will find this observation borne out. It explains why more women have glaucoma than men, since they are more prone to pelvic trouble.

It is well known that glaucoma patients are of a nervous disposition, and quite frequently we see a fulminating case of glaucoma following a surgical procedure. In this connection I wish to call attention to experiences which we all have had in refraction of cases following surgical operations. These patients, especially those whose convalescence has been slow, have usually read in bed in a recumbent position. They recover with eye symptoms and headaches. They are told by the surgeon that they have eye strain, that the headache has no relation to the surgical procedure, and are referred to the oculist for glasses. I have more trouble with patients referred by my surgical friends than with any other class. Years ago I assumed that the visual difficulty was due to muscular weakness. After most careful refraction I noticed that the patient did not improve, and I saw that my colleagues had the same results. I now believe that the headache and eye discomfort is due to a cardiovascular disturbance and that the patients will recover as quickly without refraction if they are handled properly.

The purpose of this paper is to stress clinical opinions and observations.

(1) All glaucoma patients are sick persons and should be given the protection of a general and careful physical examination.

(2) All of them have disease of the sympathetic nervous system, which produces a disturbance of circulation.

(3) This disturbance of circulation is responsible for the syndrome called glaucoma.

(4) It is quite probable that a large proportion of glaucoma patients have an anatomical predisposition due to faulty development.

(5) The importance of conjunctival drainage after operation is a myth.

If most operators will review their cases, they will find that the visual field holds just as long in cases without conjunctival bleb as with it.

I have long been an advocate of cyclodialysis as the best procedure for the relief of tension. If the theory of glaucoma is correct and we are dealing with an exudate that has closed drainage, cyclodialysis certainly offers greater possibilities for freeing the root of the iris, establishing function in the space of Fontana and the canal of Schlemm, and thereby opening drainage along natural channels.

I appreciate the fact that cyclodialysis has suffered because of extravagant claims of its advocates, but in my experience it has served well.

Four years ago I received a reprint from Dr. J. W. Jervey, of Greenville, South Carolina, describing an operation for glaucoma which he called "sclero-post-iridectomy." It is in fact a "glorified cyclodialysis," as it combines a basal iridectomy. Many of you no doubt are conversant with his operation. I have taken the liberty of reproducing his cuts and he has kindly consented to open this discussion. I realize that one swallow does not make a summer, and many operations for and theories of glaucoma have been abandoned. However, after four years' experience with this operation, I am well pleased with the results. The tension has remained down and the fields are holding, and we have no conjunctival bleb. I commend it for your consideration. I have had only one failure, and that was not a suitable case. I doubt that any procedure would have helped it. The patient had a deep anterior chamber and is now blind. He was operated upon two years ago. I have never seen a case of this kind benefited by any procedure.

In conclusion, I wish to emphasize this point: when a diagnosis of glaucoma is definitely made the patient should be carefully checked by an internist and the eyes should be operated upon. An oculist should have the courage of his convictions or change his job. It is my practice to continue medical remedies after operation. I prefer pilocarpin and ethyl morphine hydrochloride (dionin) as they promote drainage. Eserine is useless as a curative agent; it acts only mechanically and should be discontinued after operation.

It is not intended to discredit any of the established operative procedures for glaucoma. Good results have been obtained from all, but it is our purpose to stress the importance of establishing drainage along normal channels. I have definitely abandoned the trephine, because in my experience more complications follow this operation.

The enigma of glaucoma remains with us. Since von Graefe, we have been thinking of arteriosclerosis and vascular changes. Clinically, it seems to me to be a neurosis. Upon what other theory can we justify juvenile glaucoma or an acute attack following surgery?

Before closing I wish to mention one phase of this syndrome which starts as a purely mechanical condition and which is often overlooked. I refer to incipient cataract followed by increased tension, caused from a swollen or disintegrated lens. We are prone to tell a patient with beginning opacities, "Your cataract is not ready for operation. Come back when your vision gets down to large objects and we will operate." This is bad advice, since they do not understand the importance of regular examinations. It is the oculist's duty to check these patients at least every four months for increased tension or other changes. Many operators advocate a preliminary iridectomy for various reasons, but the best reason is that it should in a large measure prevent pressure symptoms while the lens is maturing.

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DISCUSSION (*Abstract*)

*Dr. J. W. Jervey, Greenville, S. C.*—It is highly gratifying to me of course that a man of the outstanding ability and wide experience of Dr. Burleson should have adopted my procedure of sclero-post-iridectomy for the relief of high tension in glaucoma. You note that in the past three years, having adopted this operation exclusively, Dr. Burleson has had but one failure, and this he tells us was in a case of glaucoma with deep anterior chamber. Obviously, this procedure is not adapted for use in cases of this character. Where the anterior chamber is deep the canal of Schlemm is presumably open. This operation is designed to open and open freely the passages known as the canal of Schlemm. Where these passages are already open this operation can be of no assistance and it is in such cases that some procedure like an Elliott or LaGrange operation establishing a filtrating cicatrix must be resorted to. I hope it will be remembered that in my earliest articles describing this procedure of sclero-post-iridectomy I particularly emphasized the point that it was not applicable in cases of deep anterior chamber.

Dr. Burleson deliberately avoids taking up the question of the etiology of glaucoma, but he does mention a practical observation which he has made which is of interest to me and heretofore unknown to me, namely: that practically every case of glaucoma has associated with it some pelvic disorder, and inasmuch as women are more disposed to have pelvic trouble than men, he argues that this is one excellent reason why more women than men are the victims of glaucoma. In my last two or three cases, since reading Dr. Burleson's article, I have carefully investigated this point, and in each case found the history of pelvic trouble. In this connection I want to suggest the possibility that glaucoma is a manifestation of endocrine disorder or imbalance, perhaps an interference of the balance between the sympathetic and parasympathetic nervous system on the one hand and the endocrine system on the other hand, and inasmuch as insulin is supposed to be a stabilizer or balancer of the whole endocrine system, it is interesting to note that practical experiments are now being made looking to establishment of the value or otherwise of the use of insulin in the treatment of glaucoma. I am sure that more will be heard about this later.

*Dr. Grady E. Clay, Atlanta, Ga.*—Dr. John E. Weeks has said: "Whatever method the operator can use with confidence is the best method for him." I have had no experience with the operation, cyclodialysis, described by Heine or the many variations in technic of this operation, and therefore have not that confidence.

Dr. Burleson apparently uses this operation in all types of glaucoma, which differs from the views expressed by Heine and adopted by most of the advocates of cyclodialysis, namely: "The more chronic the glaucoma and the less urgent the indications for immediate operation the more favorable will be the result of a cyclodialysis."

Knapp states that the operation is a temptingly simple one, but that results have been disappointing and the return of tension, which is likely, may be abrupt and stormy. It is true that cyclodialysis by reason of its simplicity is safe in the hands of most operators, but I am not inclined to feel that way about the modification by Jervey advocated in Dr. Burleson's paper.

The treatment of glaucoma will remain largely surgical until its pathogenesis is more definitely known and no operation at present advocated has the approval of all operators as indicated by the fact that there are today over forty operations for glaucoma. However, the great majority of ophthalmic surgeons are united on the surgical treatment for acute congestive glaucoma and the absolute hemorrhagic glaucoma, for the former basal iridectomy and the latter enucleation. The chronic inflammatory glaucoma and glaucoma simplex I believe at present is most successfully treated in most clinics here and abroad by some type of filtration operation, namely: the trephine, LaGrange, modifications of anterior sclerectomy, sclerectomy and iridencleisis, and least important of all iridotasis. I do not agree with Dr. Burleson that these operations do not produce a filtrating scar. I am sure they do and it is in this manner that the tension is lowered; if filtration is not established or if later the filtrating scar should become closed, tension will become increased.

I had the pleasure of seeing the work of Elliot when he visited this country in 1914 and followed many of his operative cases for four years with such strikingly good results that I have continued to use his operation since that time with added confidence each year. Elliot's technic is practically the same today as presented at that time. The mistake often made is in not dissecting down a good conjunctival flap, and in the attempt to split the cornea down too far, using a knife. The most important factor in a successful operation is the use of a perfectly sharp trephine blade of 2 mm. size. Personally, when possible, I like to hinge my flap towards the cornea, cut the bulging iris with iris scissors without grasping it, in this way getting a small peripheral iridectomy, and then cut away about half of the button, leaving a small filtrating hole.

It is true that practically all ophthalmic surgeons use the trephine operation after their other operative procedures have failed. I feel that its use first in all cases except those already mentioned would give the best results. However, the presentation of a paper reporting good results with this operation and similar presentations will help us to select the ideal operation. As Dr. Burleson has suggested, the time may not be far remote when these cases will be treated largely medically.

*Dr. Oscar Wilkinson, Washington, D. C.*—I have never had the temerity to try the Jervey operation, as I felt that it had potential dangers, of injury to the lens, and so on. Besides, I have always considered that operation best which accomplishes the desired result with the least possible injury to the tissues. I believe in glaucoma this can best be secured by the Elliot operation or by iridencleisis.

*Dr. Ray K. Daily, Houston, Tex.*—There are several points in Dr. Burleson's presentation which are well worth emphasizing. He pointed out at the start that glaucoma is an ocular symptom of a sick patient and not merely an ocular disease. A great many of us perform our favorite operation on an eye as promptly as the patient will let us after the discovery of a high tension and feel that our duty is done. After a disappointment in our results we adopt another type of operation, until it, too, blasts our hopes and sends us to a newer surgical procedure. Years ago Abadie in France contended that a glaucomatous patient has a constitutional disturbance and should be treated from that standpoint. A few years ago, Inman demonstrated a relation between glaucomatous attacks and disturbances of the subconscious. Therefore Dr. Burleson's emphasis on the constitutional disturbances is most timely; careful study of glaucomatous patients from this angle may lead us out of the wilderness in which we still are today. Another interesting feature of Dr. Burleson's paper is the fact that after forty years of experience with surgical procedures in glaucoma he considers satisfactory only the one which he has used for the last few years. And this is in line with the attitude of most ophthalmologists, who abandon one procedure after another, the last one being always satisfactory. Is it not possible that one surgical procedure cannot be applied to all cases of glaucoma and that all procedures have their indications? The height of tension, the degree of contraction of the visual field, even the race and color of the patient should be carefully studied before deciding what procedure to use. We know from experience that Elliot's trepanation will hold down the tension in a white patient, while in colored patients the scleral opening fills up with fibrous tissue. To evaluate properly the various surgical procedures we need numbers of cases with systematic records of the tension, fields, central vision and fundus changes extending over a period of many years. So far, such statistics are not available, and to obtain them we need the collective effort of all ophthalmologists.

*Dr. Dunbar Roy, Atlanta, Ga.*—I have enjoyed this paper of Dr. Burleson's, but do not feel capable of making any criticism *pro* or *con*, in that I have never performed the operation, nor have I ever seen the results of the operation from the surgical hands of any other operator. However, Dr. Jervey is a clear thinker and an original worker. This paper shows the usefulness of his operation in certain selected cases.

Personally, I have always thought that the operative procedures in cases of glaucoma should be looked upon just as other operations should be considered. Let

each man use that operation which in his hands has given him the best results. I have never seen any reason to change my technic in any operative procedures just to try out some new method. This same principle applies especially to tonsillar operations.

For the last twenty years, I have used the operation of iridotasis which has given me most excellent results. In cases of old glaucoma where there is atrophy and degeneration of the iris, one operation will give as good a result as another, and yet attempted iridectomies seem to me to be the best in such cases. The Elliot operation is difficult and requires a skill in its technic. The LaGrange operation is still more difficult, but is much preferred by many operators. My own rule is to stick to that operation with which you are most familiar and which has given you the best results.

*Dr. K. W. Constantine, Birmingham, Ala.*—I shall report briefly my operative experience with iridencleisis.

During the last twelve months I have performed this operation on thirty glaucomatous eyes in eighteen individuals with 100 per cent success. Only one of these patients, a juvenile case, has required any special treatment and the tension in this case has been reduced until as far as we can tell it is not causing further damage to the eyes. During the previous three years I had the same success operating upon thirty eyes in twenty-one patients, with the exception of one case of congenital glaucoma and one case of juvenile glaucoma.

As previously described, this operation consists in laying down a large conjunctival flap, including Tenon's capsule, to the cornea. With a cornea knife especially designed for this purpose, a straight incision of 2 or 3 mm. is made at the limbus into the anterior chamber. If the iris fails to present in the wound it is grasped with the iris forceps or a blunt hook and a straight iridotomy is performed. One edge of the iris is drawn into one angle of the wound and the other edge of the iris into the opposite angle. The conjunctival flap is replaced and secured with a running silk suture. The patient can leave the hospital in four days and can usually return to work in ten days.

*Dr. Burleson (closing).*—There are several points which I wish to stress in the discussion of this subject:

(1) The fallacy of the filtrating scar (conjunctival bleb). My experience has been that I get as good, if not better, results if the bleb is absent after operation.

(2) Where the tension is positive, even if it can be lowered with treatment, operation is indicated, as it gives double security.

(3) Cyclodialysis is a much better procedure, in the majority of cases, than iridectomy.

(4) The post-scleral iridectomy as described by Jervey is a distinct advance in ophthalmic surgery, in that it combines a basal iridectomy with a cyclodialysis.

(5) My experience has been that the trephine is more uncertain and more often followed by complications than any procedure used for the relief of tension.

(6) All operative procedures should be followed by continued treatment, preferably pilocarpin.

## A COORDINATED NATIONAL HEALTH PROGRAM*

*By* A. T. McCormack, M.D.,
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Those of us gathered at this session of the Southern Medical Association and the Southern Branch of the American Public Health Association, who limit our practice as physicians to preventive medicine and public health, can take pardonable pride in the effectiveness of the public health administration which has been perfected during the past fifty years. At a time when, for a four-year period, twelve million wage earners have been unemployed and possibly twice as many more have been receiving such marginal employment as barely to furnish the minimum necessities of life, we have beheld, for the first time in recorded history, a continuous lowering of morbidity and mortality rates. The suggestion of some in high places that these results are due to the lowered purchasing power of our people is both absurd and tragic: absurd, because it is an obvious *non sequitur;* tragic, because it gives superficial legislators a further excuse for the destruction of essential health budgets. It is unfortunate, during a period when every industrial, commercial and financial organization in the land, along with social workers and educators, who are our most obvious allies, are sounding the tocsin of alarm and are attempting, under the guise of emergency demands, to enact permanent legislation, which to thoughtful students of social planning has long been obviously necessary, that the leaders in the medical, and especially public health services, should sit quietly by and watch the excellent programs that have been provided shunted into reference libraries and waste baskets and see the service organization we have given our very lives to build decimated and deteriorated. During all of this destruction, are we to sit silently by, while our skill and service are most obviously needed, and let the progress of public health and medical service be retarded for decades, content to preserve for ourselves and for posterity merely the framework of the structure we have been proudly rearing for the past half century?

The principles of public health administration and the practical machinery for the development

*Read in Section on Public Health, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

of Federal, state and local health services, and their proper coordination, were soundly developed by the Committee on Public Health Administration of the White House Conference. Inter-bureau jealousies at Washington prevented this work from being wisely completed, as it should have been, and the publicity resulting from the scrap distracted public attention from the merits of the proposals and has so far prevented American legislators from considering them seriously. Even the monumental work of the New York State Health Commission, appointed by the then Governor, now President Roosevelt, has been of practical use only in New York State, whereas, as a matter of fact, it has set the standards and should be the pattern for public health administration in every state, in every county and city of every state, in the whole nation. In appointing this Committee, Governor Roosevelt said:

"As an agency for serving the needs of the people, government should not be a static force, but should evolve to meet a changing and developing body of knowledge. This is particularly true in the field of public health in which, during the past decade or two, the far-reaching development of scientific facts upon which governmental action is based, makes particularly necessary a periodic examination of the extent to which the state is meeting the needs of the people in this vital field."

He further quoted, with approval, a statement recently made by our beloved Dr. William H. Welch, dean of American medicine:

"While public health is the foundation of the happiness and prosperity of the peop'e and its promotion is recognized as an important function of government, how wide is the gap between what is achieved and what might be realized; how inadequate is the understanding of the public concerning the means adopted to secure the best results?"

He requested this Commission

"to take into consideration the activities of state and local health authorities and their relations one to another, the recent progress in public health in other states and abroad, and to examine critically the extent to which the health needs of the people were being met."

In his foreword, presenting the report of his Public Health Commission to the people and Legislature of New York, Governor Roosevelt said:

"Attention is called to the marked inequality of health services now being rendered in different communities, constituting an inequality of opportunity for citizens to acquire and maintain health because of lack of local machinery for organized health protection; lack of understanding on the part of citizens as to the measures necessary to preserve individual health; and inability on the part of many citizens to procure needed preventive care.

"One reason for the existence of such inequalities is found in the unevenness of popular sentiment for health action. For example, although much has been done against tuberculosis, relatively little has been done to combat syphilis, which is a comparable disease as regards its prevalence in the population and the economic losses resulting from its spread. Cancer, too, although the second most frequent cause of death, receives little attention from the public at large.

"Yet the inattention of certain committees to organized health protection even for those activities in which public interest generally has been aroused, results in some shamefully high death rates. Other than the indifference of local governments, in this year of modern achievement, 1932, there is no reason for tuberculosis to be twice as prevalent in some counties as in others; for deaths and illnesses from diphtheria to continue to occur when some municipalities have been able to stamp it out entirely; for twice as many babies to die each year in some counties and cities as in the communities where a modern health program is in force; for the rate of decline of many preventable diseases and certain death rates to be higher in rural communities, with no organized health service, than in urban communities where health service is available; or for those citizens of the lower economic rank to suffer a higher death rate from practically all causes.

"In striking contrast with conditions in the apathetic communities are results attained in the modern health demonstrations which New York State has been fortunate enough to have had located in Cattaraugus County, in Syracuse and the Bellevue-Yorkville district of New York City. These demonstrations have worked out simple and practical technics of local public health service and have shown convincingly that not only is 'public health purchaseable,' but its price is much less than the price of neglect.

"Unfortunately our citizens are not likely to be better served so long as health programs must be executed by our present system of town and village boards. Upon previous occasions I have discussed the unsuitability of town and village as local governmental units to meet the needs of present-day civilization. In no phase of government is this more strictly apparent than in public health. The present town and village board of health, with a partly-trained, part-time health officer, created originally to meet the conditions of 1850, is utterly inadequate for the needs of 1932. Our citizens cannot through this means provide themselves with needed services for the control of infectious disease, for measures against tuberculosis and the venereal diseases, for preventing deaths of mothers and the safeguarding of infant life, for the safety of public milk and water supplies and the protection of natural waters against pollution, for more public health nursing more effectively rendered, for laboratory diagnostic service and for all other elements of a modern health program.

"The Commission has urged the creation of fifty-seven county boards of health to replace the present 1,158 town and village boards. In county after county it has become clear that the small local units cannot perform such imperative public health duties as the maintenance of tuberculosis hospitals, of diagnostic laboratories, or of well rounded nursing programs. They

frequently have been organized upon a county basis, but in a hit-or-miss fashion, no authority being clearly charged with the duty of developing a complete and efficient health program. The results have been that the several county boards and committees dealing with special phases of public health have been superimposed upon the original town and village boards of health; and, in addition, there is a system of state sanitary districts with state personnel supervising county, town and village activities.

"Because of the confusion of responsibility, lack of coordination and waste of effort arising from these circumstances, it is not difficult to understand that local health services in New York, with a few lambent exceptions, render to the average citizen a very small amount of service in proportion to total cost. Important as it is, however, that costs of government be reduced where possible during these trying times, it is even more important that health service be available where service is sorely needed. The Commission has analyzed carefully the cost of local health boards as well as the work they perform, and has reached the conclusion that much more service now urgently needed can be purchased with the same dollar now spent. By the utilization of state aid already available under present laws, a modern, well rounded health protection service can be set up at a cost from local taxes no greater than present expenditures which are even more wasteful of lives than of money. If by this means there were accomplished but the single service of cutting in half again the present tuberculosis death rate, the modest net increase in state expenditures required for state aid to county health departments would be more than balanced by the reduction of present expenditures for the hospitalization of patients with tuberculosis.

"The Commission has not been academic or theoretical in its recommendations. It suggests that the establishing of county health departments be staggered over a period of five years to allow the counties ample time for planning of programs and arrangement of budgets and abundant opportunity to obtain trained men. Health departments would be established first in the largest counties where the need is greatest. An admirable plan has been worked out for the voluntary union of city and county to form a joint health department.

"In the opinion of the Commission, health functions which local governments can be equipped to perform satisfactorily for themselves should not remain functions of the state. Obviously, our people are entitled to better health service than they are now receiving. The simplest method of providing them with it would be to build up a powerful, highly centralized, expertly manned State Department of Health which could supply all essential services as efficiently as the State Department of Public Works can supply essential highways.

"But where roads have a single, simple, impersonal function, health service has multiple, intimately personal functions. Its fullest utilization requires understanding and cooperation from those whom it serves. It is for these reasons that I heartily endorse the opinion of the Commission that it is unwise to plan extension of the activities of the State Department of Health into fields better served by competent county health departments and its recommendations for curtailing certain present activities as rapidly as strong local authorities are set up to take over the tasks. There are reserved as the ultimate functions of the state only the maintenance of adequate standards, financial assistance for rural health services and such duties as the hospitalization of mental disease, the general supervision of public water supplies and the registration of births and deaths, which of their nature are too technical, too broad in scope, or too costly for satisfactory local performance."

The last paragraph of his commendation of the report of his Health Commission was stated by Governor Roosevelt as follows:

"The rewards of following this plan will redound to ourselves as individuals, no less than to the prosperity and progress of the State. No considerations are involved other than to prevent needless death and suffering for the people and needless social and economic loss for the State. We have gone far enough in the right direction to be assured that we can finish the job. The tools for it are designated and the methods outlined here."

Of the White House Conference, it was said:

"The health needs of a community, as well as the effectiveness of its health program, must be determined by a careful analysis of diseases and disorders affecting its population. It is proper to look to the local government for those elements of health service that progressive cities and counties recognize as governmental responsibilities. But there are many cities and counties that are unable to initiate and direct a complete program of these activities. It has proven both wise and feasible for the state government to assume the responsibility for the promotion and guidance of the health program in such communities. The Federal government also plays a role in health programs. It must assume the national and international health responsibilities assigned to it by law, and it is likewise assuming a more and more active part in the development of local activities throughout the country.

"In this study the agencies that participate in health service have been considered as units that play a definite part in a coordinated scheme. These agencies are: the county, city, state and Federal governments, the practicing physician, and the private health agencies. The recommendations growing out of the study are drafted to cover, as far as possible, those practices and procedures that have proven sound and capable of further expansion. They present a coordinated plan aimed to insure public health service of a higher type and wider scope for every part of the nation, and place special emphasis on measures to benefit the health of the individual child."

The Committee further said:

"Students of government and national legislators are now endeavoring to determine how the Federal government may assume a definite part in the internal development of the nation in addition to its present responsibility for research, prevention of the introduction of disease from without and control of spread of disease between states. Experiments concerning the participation of the Federal government in the promotion of local health service have been going on for more than ten years, and have now reached the point where certain conclusions may be drawn.

"Until recently the best thought in public health ad-

ministration has been directed to the content of a public health program and to the technic involved in the application of procedure. Comparatively little attention has been given to the responsibility of the various agencies involved in the total program and the relationship which should exist between the local, state and national agencies. It is not uncommon to find several organizations working in the same area on particular units of a public health program without central administrative control or professional direction.

"But since health service draws upon all of the medical sciences and utilizes the social resources of the community, the various agencies which are interested in or which may be concerned in the promotion of public health in one locality, must of necessity develop a sense of responsibility and a desire to cooperate.

"The present lack of application of standardized measures for the prevention of illness and the promotion of health can be traced, in large measure, to imperfect organization. There are, however, definite signs of improvement. Public health administrators are beginning to evaluate public health measures in relation to local problems and to develop local programs which utilize the available resources so as to accomplish the greatest good for the greatest number.

"A better understanding of the position which health should occupy among the functions of government and the manner in which local, state and Federal governmental agencies may direct their resources toward a common objective is also being developed. Consideration is also being given to the services non-governmental agencies may perform in the coordinated scheme of public health organization which is gradually evolving."

The recommendations of the Roosevelt New York Commission in regard to state aid are not only so pertinent to the discussion of that important policy, but apply so forcefully to the whole question of Federal aid, that I am quoting it in its entirety, substituting "Federal" for "state:"

"Careful consideration has been given to the policy of Federal aid in public health which has been in operation for almost a decade. The conclusion has been reached that Federal aid is a necessary policy, particularly for rural areas and in the development of new health activities.

"Public health problems are never wholly local. For example, the existence of a communicable disease threatens other communities besides that in which it arises. There are very practical reasons, therefore, why the United States should give financial and technical advice to stimulate better local health conditions. Sound precedent for it is to be found in other phases of community welfare. In fact, the Commission is of the opinion that the only alternative to Federal aid for rural health service is operation by the Federal government itself of direct health services to the people. Those who believe that Federal aid is undesirable must concede that its inevitable alternative is even less desirable from the standpoint of preserving local responsibility in the administration of health work.

"Under the present conservative policies of granting Federal aid for county nursing services and county health departments in rural areas and similar health services, much has been accomplished in promoting the public health which otherwise would not have been done.

"The Commission recommends, therefore, that Federal aid be continued for the development and operation of local health activities.

"HEALTH ACTIVITIES FOR WHICH STATE AID IS GRANTED

"State Aid to Counties. This law provides that 'Whenever the board of supervisors of any county shall appropriate and expend moneys for the construction, establishment or maintenance by such county of a county, community or other public hospital, clinic, dispensary or similar institution, or for the purpose of defraying the expenses of such county in any public enterprise or activity for the improvement of the public health, or any public health work undertaken by such county within limits to be prescribed by the state commissioner of health, such county shall receive state aid. . . . The legislature from time to time shall make appropriations for the purpose of rendering such state aid. The state commissioner of health is hereby empowered to prescribe limitations upon the aid to be granted. . . . He shall formulate standards of construction, equipment, service, administration and work which must be complied with by such counties in order to be entitled to state aid, and no state aid shall be given to any county unless the state commissioner of health, after inspection and examination . . . shall make his certificate that such construction, equipment, service, administration or work is necessary to the public health and conforms to the standards so established therefor.' The law provides, also, methods by which counties shall make application for state aid, and the reports required upon the use of funds.

"By various provisions of the county law and public health law, county boards of supervisors are authorized to conduct a number of health activities for which state aid legally may be approved. These include: the construction and maintenance of county tuberculosis sanatoria, general hospitals and field services for tuberculosis control; county health departments, public health nursing services; milk inspection and sanitation services; and the employment of physicians for clinic activities, such as toxin-antitoxin administration and venereal disease control.

"After passage of the state-aid-to-counties law, many counties applied for assistance in the construction and operation of tuberculosis sanatoria. A conservative policy was adopted, however, whereby the commissioner of health limited state aid to new health activities, not then under way, and excluded aid to tuberculosis sanatorium construction and maintenance on the ground that these were established activities.

"Among projects approved for state aid in 1931 are the county health departments of Cattaraugus, Cortland, Suffolk, and Westchester counties, which obtain $194,197.50. In addition, 35 counties receive aid for public health nursing and two, Monroe and Warren, for milk and sanitary inspection. Aid is given to county hospitals in Lewis, Wyoming and Greene counties, and 15 counties receive financial help from the State in the establishment and maintenance of preventive clinics—commonly tuberculosis, infant welfare, or the administration of toxin-antitoxin.

"The total amount appropriated for state aid to counties for all purposes in 1931 is $366,043.

"The Commission believes that the state-aid-to-counties law is one of the best public health laws to be found on the statute books of any state. By its judicious application, an enormous influence will continue to be exerted for the improvement of the quantity and quality of local health service."

The whole matter of local health service is summed up by the New York Commission briefly and forcefully as follows:

"These successive legislative enactments indicate an increasing official recognition that the care of the public health is a responsibility of government, and that it is more than a local responsibility."

Equally well said:

"In the modern hea'th program, qualified health officers, nurses, engineers, laboratorians, and other professional personnel on a full-time basis, are essential if satisfactory service is to be expected."

In summing up its recommendations in regard to local health service, the Roosevelt Commission said:

"The United States Public Health Service, as a result of exhaustive studies of rural health needs, for many years has actively sponsored the county health idea through financial aid to demonstration counties and otherwise. This program has received the endorsement of the physicians of the country through resolutions of the House of Delegates of the American Medical Association.

"The Rockefeller Foundation, created 'to promote the well-being of mankind throughout the world,' has directed the major energies of its international health division to the development of local health departments on a county basis with full-time qualified personnel. It is significant that this great philanthropic organization, with the world as its theatre of action and with the well-being of mankind its concern, centers its activities so largely upon health and its health activities so largely upon the county health unit.

"The recent White House Conference on Child Health and Protection, after reciting the needs of childhood in health, education and welfare, concludes its 'children's charter' with a forceful statement of the organization necessary to give effect to the principles of child health conservation: 'To make everywhere available these minimum protections of the health and welfare of children, there should be a district, county, or community organization for health, education and welfare, with full-time officials, coordinating with a state-wide program. . . . This should include: trained, full-time public health officials, with public health nurses, sanitary inspectors, and laboratory workers. . . .'

"The health section of the League of Nations has devoted much consideration to the rural health problems of the world and has done much to promote local health service and improve the qualifications of health officers in many different countries.

"The national leaders of both political parties have expressed approval of the plan."

President Herbert Hoover has said:

"Our country has a vast majority of competent mothers. I am not so sure of the majority of competent fathers. But what we are concerned with here are things that are beyond her power. That is, what Susie and John take on when out from under her watchful eye. She cannot count the bacteria in the milk; she cannot detect the typhoid which comes through the faucet, or the mumps that pass around the playground. She cannot individually control the instruction of our schools or the setting up of community-wide remedies for the deficient and handicapped child. But she can insist upon officials who hold up standards of protection and service to her children. . . . She can be trusted to put public officials to the acid test of the infant mortality and service to children in the town. . . .

"These questions of child health and protection are a complicated problem requiring much learning and much action. . . . Let no one believe that these are questions which should not stir a nation; that they are below the dignity of statesmen or governments. If we could have but one generation of properly born, trained, educated, and healthy children, a thousand other problems of government would vanish. We would assure ourselves of healthier minds in more vigorous bodies, to direct the energies of our nation to yet greater heights of achievement. Moreover, one good community nurse will save a dozen future policemen.

"We have grave responsibilities to the rural child. Adequate expert service should be . . . available to him from maternity to maturity. Since science discovered the cause of communicable diseases, protection from these diseases is as much an obligation to them as to the child of the city.

"Public health service should be as fully organized and as universally incorporated into our governmental system as is public education. The returns are a thousandfold in economic benefits, and infinitely more in reduction of suffering and promotion of human happiness.

"In the practical working out of organization, exhaustive experiment and trial have demonstrated that the base shall be competent organization of the municipality, county or other local unit . . . some 400 rural counties . . . now have some such unit organization. Where highly developed, a health unit comprises at least a physician, sanitary engineer, and community nurse with the addition, in some cases, of another nurse devoted to the problems of maternity and children. Such organization gives at once a fundamental control of preventive measures and assists in community instruction."

Ex-Governor Alfred E. Smith has said:

"We have here the fundamental problem that this State is constantly being confronted with: that the day has come when we must get away from some of the machinery of government that was set up when it took a whole day to get here (to Albany) from New York. . . . In 1923, I called a conference in this room of physicians from all parts of the State to discuss medical service and health work in rural communities. It was recognized as a matter of state-wide concern. Disease does not stop at the town and village boundaries. . . . Distance has been annihilated by the automobile and speedy trains, by direct communication through the telephone and now with the radio. We are all neighbors together.

"The old-fashioned idea of public health work was that some one came around and stuck a red or yel-

low flag on the door and locked everybody in, and that was all there was to it. That is not the state's idea of public health work today. It includes clinical service, laboratory service, nursing service, an educational program for the prevention of disease, opportunity for better treatment, and for treatment suited to the needs rather than to the pocket book.

"There has been a drift toward county administration of certain health matters for some time. . . . The drift indicates that the time is not far away when public health will be a county function if it is properly and scientifically, and incidentally, let me say, economically, managed.

"The unit for local public health work should be the county with a full-time qualified county health officer who should be made responsible for the conduct of local health matters within his jurisdiction, with only such supervision as the state may be required to give in an advisory capacity. Such an organization has been possible under the law (in New York State) for several years; yet only one county, namely, Cattaraugus, has seen fit to take advantage of it, and with the very best results in promoting the physical welfare of the inhabitants."

The Section on Public Health Service and Administration of the White House Conference summed up its entire argument in saying:

"Federal grants in aid of health should be continued and increased by specific congressional act."

The arguments and suggestions herein presented have merely recognized the existing state of mind of the public health administrators of the United States. Within our own organizations we have convinced ourselves of the needs of our people and of the type of service that should be rendered. We have utterly failed in demonstrating to the public, and particularly to the statesmen who control its affairs, that our views on this subject are worthy of any consideration at all.

I respectfully submit that the necessity for a strong public health service, transferred from the Treasury to one of the service departments of the Federal government, whether Interior or Labor is immaterial, coordinated with the Federal Bureau of Education and Welfare, should be frankly recognized. The Public Health Service should be divorced from welfare activities, but should retain control of and assign trained medical personnel permanently to other Federal activities requiring medical service, except, of course, the Army and Navy. The National Health Institute should be greatly enlarged and its research functions encouraged and increased. Field investigations and demonstrations in specific problems should be authorized whenever any particular problem is of sufficient magnitude to warrant it. A constant reserve of personnel should be ready for assignment as substitute for state and local personnel in training as well as to augment such services during emergencies. State health departments should cooperate with the Federal service in providing education for and standards of personnel and should retain only such laboratory and consultation services as are necessary for the effective functioning of local service.

The major emphasis should be placed on the development of thorough and complete county and city health departments which should reach into the homes of all of the people. Counties and cities which have sufficient taxable resources should maintain their own departments with only such state and Federal contributions as would make them a part of the health service of the Union. However, the same relative health protection should be extended to every family in the country and each state and the Federal service should have a sufficient revolving fund to secure equalization of public health service.

The development of such a program and the demonstration to the President of the United States, to the Congress, and to the governors and legislatures of the several states of its necessity and economy constitute the next necessary step in public health administration.

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## MITE INFESTATION IN THE HUMAN INTESTINE*

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This paper is based upon two cases of gastrointestinal infestation by mites, with associated diarrhea.

Heretofore mites have been found to be the cause of severe dermatitis in persons who handle vanilla pods, copra and other substances which are infested with these organisms. Rousseau[1] described a case of vulvo-vaginitis due to mites in a three-year-old child. Trouessart[2] reported the finding of about 800 mites in a scrotal cyst originating from the epididymis. Forms representing all stages in the life history of the mite were found present. Since in a previous illness catheterization had been necessary, he

*Received for publication August 1, 1933.

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presumed that some female mites had been introduced into the posterior urethra by catheter, from which they had found their way to the vas deferens. Mites have also been found living as parasites in the urinary tract, as proven upon catheterization and cystoscopy.[3 4 5] Thirty such cases were collected and reported by Mekie,[6] all of which showed symptoms of irritation of the urinary tract.

Since mites are abundant in foodstuffs, it is not surprising that viable eggs, larvae and adults of several species have been found at fecal examination, as reported by several authors. Chandler[7] refers to the historical case of dysentery due to such an organism which occurred in one of Linnaeus' students:

"The mites were abundant in his feces and were found to live and multiply in a juniper-wood cup which he used."

Very little exact information exists as to the gastro-intestinal disturbances produced by the accidental ingestion of mites. Hase[8] has given much study to this matter because of the use of "Altenburger Milbenkäse" (Altenburg mite-cheese) as an article of diet at Altenburg in Germany. This is a hard, dry cheese, made from cow or goat milk, which is placed in crocks containing myriads of mites which attack the cheese, eating it and burrowing into and through it. After some months the cheese is thought to be ready for eating after some of the mites are dusted off. From general observations this author finds that those eating the cheese for the first time must eat only small quantities to prevent the occurrence of intestinal disorders. Persons eating the cheese regularly may consume fairly large quantities, though some develop an allergic sensitization to it.

### CASES OF INTESTINAL ACARIASIS

Intestinal infestation by mites, *Tyroglyphus longior* Gervais, was found by one of us (E. H. H.) in two patients on fecal examination (*Fig. 1*).

The first case was that of a twelve-year-old white girl seen in the Pediatric Clinic because of abdominal pain. On February 16, 1933, she complained of cramping which persisted for several days, and with which was associated a mild diarrhea. Four days later she consulted the pediatrician and a specimen of stool was brought for examination on February 21. The stool was moderately well-formed and one mite was found. At this time no especial significance was attached to the presence of a single mite and it seemed quite possible that the association with abdominal pain and looseness of the stool was entirely accidental. Except for the finding of mites in the second case some days later, this infestation would not have received further consideration. Contamination of the specimen jar in this case cannot be excluded. Upon further questioning of the mother as to intestinal disturbances in other members of the family, the following information was elicited. Just previous to this attack, pork sausage ("head cheese") had been eaten by all members of the family. A younger sister of the patient had nausea and vomiting, but no further symptoms were reported.

Reinfestation apparently did not occur. Examination of the patient's feces two weeks later revealed no mites. Tests for occult blood at that time were strongly positive.

The second case was that of H. A., aged 29, admitted to the ward of one of us (R. H. K.) in Charity Hospital on February 22, 1933. He was a male American negro who had lived on a farm in Louisiana all his life. The provisional admittance diagnosis was amebiasis.

His chief complaint was diarrhea. Four years previously the patient developed diarrhea, which persisted for one year. During that period he had six to eight liquid stools per day. At times a little blood and mucus were passed. This attack of diarrhea then ceased spontaneously. For the next two years the patient was entirely well without any intestinal symptoms. At the end of this time, or about one year ago, he had a recurrence of diarrhea, presenting the same characteristics as before, except for the absence of blood or mucus in the stools. After several months of diarrhea, it again spontaneously stopped without symptoms for three or four months.

Two months before admission to the hospital, diar-

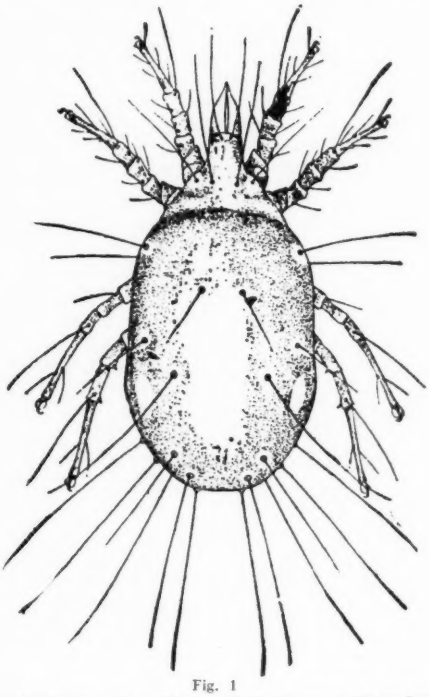

Fig. 1
*Tyroglyphus* sp. (From Marlatt, U. S. Bureau of Entomology.)

rhea again appeared, persisting to the date of his entry into Charity Hospital. The intestinal symptoms had been constant in recent months, with no cessation at any time. Six or eight stools were passed in twenty-four hours. Neither blood nor mucus was seen at any time following the attack four years before. Pain, tenesmus, incontinence or cramping had not been experienced.

The appetite was good throughout the course of the disease and no time was lost from manual labor during this period. The diet included cooked vegetables, eggs, fresh meat, bread and cheese.

The past history was essentially negative.

The patient was living with his father and stepmother, neither of whom had diarrhea.

Upon physical examination, the patient was seen to be a well-developed and well-nourished negro male. The examination was essentially negative. In the abdomen there was complete absence of tenderness and rigidity. The liver edge was palpable. There was no evidence of a skin lesion on the body or extremities.

*Laboratory Data.*—The Wassermann reaction was negative. The urine was not abnormal. Gastric analysis was done on two occasions. Free hydrochloric acid was absent both times; the total acidity varied from 5 to 10 degrees. No lactic acid nor blood were present. The hemoglobin was 60 per cent. The red cell count was 3,850,000. The leukocyte count was 4,500. Differential counts made at two different times were almost identical, showing polymorphonuclears 70 per cent, lymphocytes 25 per cent, eosinophils 4 per cent, and basophils 1 per cent. On a meat-free diet, occult blood was present once and absent once. A considerable number of living mites was found in the stool thirty-six hours after admission to the hospital.

*Proctoscopic Examination.*—The proctoscope was passed to the rectosigmoid junction. The mucosa presented a granular appearance, with slight injection. Scattered here and there in no great number were noted petechia-like spots, ulcers of about one to two millimeters in diameter. These points were generally separated from one another by two or three centimeters. Proctoscopy about a week later showed practically the same picture. Amebae could not be found.

*Clinical Course.*—The temperature was normal during the first ten days spent on the ward. Opium was used to control the diarrhea during the first forty-eight hours. After demonstration of the mites, it was decided to withhold all medication. Since the source of infestation was presumably removed, we wished to determine whether the organisms would be spontaneously eliminated and the diarrhea would subsequently disappear. By the fourth day after admission, the diarrhea had decreased so that the patient had three or four stools in twenty-four hours. Six days after admission the stool was formed and no mites were found.

On the eleventh hospital day the patient had a chill, followed by a fever of 103°. By the following day, there had developed a severe pharyngitis, progressively becoming worse, with membrane formation to be succeeded by ulcerative pharyngitis and laryngitis of streptococcal origin. Pneumonia supervened and the patient died six days after the onset of the respiratory infection.

*Postmortem Findings.*—At autopsy the cause of death was found to be "purulent cellulitis" of the pharynx, edema of the glottis and aspiration pneumonia." The wall of the large bowel was thickened and the mucous membrane showed a slight degree of congestion. The mucosa presented ulcers not over two millimeters in diameter, widely separated from one another. These appeared to be like those seen at proctoscopy. Microscopically, "sections of the large bowel showed ulceration of the mucosa with slight infiltration of the submucosa with polymorphonuclear exudate, and there is also some congestion of the submucosa." (Quotations are from the autopsy protocol of the Pathology Department of Charity Hospital of Louisiana.)

## COMMENT

In the first case, since the data are incomplete, we can only assume the pathogenesis of the mite. However, in view of the second case, it seems reasonable to suppose that mites were ingested as food contamination, that they produced intestinal disturbances and that by the time stool examination was made the majority of them had been expelled. The second case could be studied more carefully, having in mind the possibility of the mite's acting as the etiological agent in the production of intestinal symptoms.

Worthy of emphasis in the second case is the history of recurrent attacks of looseness of the bowels, with spontaneous cure. It should be noted that there was absence of the symptoms characteristic of the more common diarrheas, such as tenesmus, cramping, and the passage of blood and mucus. The finding of an achlorhydria on two occasions is at least of interest if normal digestive processes in any way may depress the activity of the mites. We can find no record of reported proctoscopic examinations such as we carried out in this interesting condition. Such observations indicate that a definite change had appeared in the mucosa of the large bowel and, due to the patient's death as a result of intercurrent infection at the hospital, it was possible to check the proctoscopic observations by the postmortem examination of the bowel. Of interest in this connection are Dickson's[3] cystoscopic findings, quoted as follows:

"The trigone of the bladder showed a large number of closely aggregated little raised hemispherical pinkish elevations with an occasional detached elevation at the edge of the patch, the whole rather suggestive of grains of boiled tapioca of pinkish color."

## DISCUSSION

Apparently mites may be the cause of intestinal disorders. Therefore it is warranted to call the attention of the medical profession to this possibility. The source of the ingested mites could not be ascertained in our cases, but having in mind the social stratum of the patients, contamination of food is probable.

Chronic diarrhea is probably due to continuous reinfestation as a result of constantly eating contaminated food. The organisms probably have only a temporary sojourn in the intestine, especially when diarrhea is present. Oviposition and hatching of eggs unquestionably occurs, but completion of the life cycle seems doubtful. Treatment would appear to consist only of the elimination of food contamination.

According to Hase, symptoms are made manifest by one of two mechanisms. Allergic reactions to mites occur as urticaria in the case of dermal involvement and as asthma from "mite-dust" in grain. Therefore, he holds that gastro-intestinal symptoms may be allergic in nature. The other and more frequent mechanism, in his opinion, is that of a toxin liberated by the animalicule. Hase considers that the mite is too small to cause irritation by its mere presence. However, it seems probable that the numerous spines on the organism may well injure the mucosa of the intestine. Other important factors are the number of mites ingested at a given time, the continuous intake with food, and the individual susceptibility. Hase carried out experiments on white mice showing the pathogenicity of the parasite in these animals. The authors will elsewhere publish studies on the experimental aspects of the question.

The incidence of intestinal mite infestation would be difficult to determine. Routine fecal examination would undoubtedly fail to reveal many cases. The eggs, if observed, might be mistaken for those of the hookworm or other nematodes. Since only a very few ova are deposited per day, they may be readily overlooked. Culture of stools obtained with adequate precaution is the most reliable method of diagnosis. It seems reasonable to believe that many cases of diarrhea with sudden onset and spontaneous cessation are due to accidental ingestion of these and closely related mites. Failure to find the parasites certainly does not exclude the possibility of their presence.

It is important to note that invasion of the urogenital tract by mites has been occasionally reported in the literature. Unclean catheters and douche tips when used by the laity or others may be the sources of contamination in such cases. It is of interest to note that pulmonary acariasis occurs in mammals, especially in monkeys, producing either a pneumonia or localized tubercles similar to those of tuberculosis. Possibly such pulmonary disease may go unrecognized in man.

SUMMARY

Two cases of gastro-intestinal mite infestation have been reported in this paper. Diarrhea was the chief presenting symptom and ceased upon elimination of contaminated food from the diet. Due to intercurrent pneumonia and death, it was possible to correlate proctoscopic and pathological findings in one of these cases.

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**Southern Medical Journal**

JOURNAL OF THE

SOUTHERN MEDICAL ASSOCIATION

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $4.00. Single copies 35c each.

Entered as second-class matter at the Post Office at Birmingham, Ala., under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1106, Act of October 3, 1917, authorized December 20, 1921.

M. Y. DABNEY, M.D., Editor
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Volume XXVII MARCH 1934 Number 3

# EDITORIAL DEPARTMENT

**SOUTHERN MEDICAL ASSOCIATION**
**Twenty-Eighth Annual Meeting**
**San Antonio, Texas, November 13-16, 1934**

## THE ORIGIN OF A PIGMENTED MOLE

Stray bits of plaster, waste materials not used in building the main body edifice, moles have been called; or mere bits of brown or hairy skin inherited from remote mammalian ancestors. Pathologists in recent years, however, are assigning them to a more complex derivation.

The mole is defined by Laidlaw and Murray,[1] of Columbia University College of Physicians and Surgeons, as an abnormal growth in the human skin, pigmented, usually elevated, often hairy, and characterized on microscopic examination by groups of nevus cells in the true skin. According to zoologists,[1] hair is primarily an organ of touch, adapted secondarily to the functions of color and warmth. Masson,[2] of Montreal, describes moles as tumors of the sensory nerves of the skin, with an innervation which on histological examination is very characteristic. The nerve terminals are of a type which is never found in normal skin, but which exactly resembles those of the early mammalian tactile organ. Laidlaw and Murray, confirming this hypothesis, have produced numerous photomicrographs which illustrate the resemblance of the nerve endings of the hairy mole to those of the mammalian organ of touch. The mole they say is to be considered not merely a spot of hair left over from the period before clothing was devised, but a derivative of a primitive mammalian sensory tissue.

For those who have considered the mole as an unnecessary appendage of the skin, sometimes to be removed for cosmetic reasons and sometimes troublesome as a possible source of a malignancy, this conception of it as an organ originally with a sensory function is of interest. The student of biology will recall other organs of touch. The cat is popularly believed to feel with its whiskers. The antenna which protrudes before the eyes of the lobster and other shelled animals is a primitive segmented tactile organ. The antenna or aerial of the radio, the line which goes out into the ether to catch its vibrations and bring them to a listener otherwise incapable of response, takes its name from the tactile organ of the arthropod. The human mole may thus by a stretch of the imagination be related to the radio antenna.

Laidlaw and Murray would take the origin of the mole back much further than the early mammals. The conception of it as a derivative of a hairy tactile tissue, they say, does not explain the nevus cells. For most tumors there is a normal prototype, but pigmented moles do not resemble anything known in normal mammalian skin. The mammalian organs of touch, the pigmented skin of the lower animals or the hairy tubercles of mammals other than man, have no nevus cells; whereas nevus cells are an almost constant feature of pigmented moles. To explain these, it is necessary to go lower in the phylogenetic scale than the mammals, to the creatures just below them, the reptiles and amphibia. These carry in their skin many elevated pigmented dots which on microscopic examination present the structure of human pigmented moles.

The Columbia workers depict the head of an alligator, covered with black dots which stand out prominently on the smooth white skin. Each dot is a tactile organ, elevated and pigmented, and its microscopic structure consists of nerve cells like those of the nevus cell. The

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2. Masson, P.: Giant Neuro-naevus of the Hairy Scalp. Ann. Surg., 93:218, 1931.

pigmented tactile organ of the alligator exactly resembles the pigmented innervated mole "in its elevation, in the local accumulation of pigment, in the group of tactile cells in the corium and the fine nerve fibers winding among them, terminating on some of them in end bulbs and menisci." In the course of evolution, as the mammal evolved from a reptilian form, the reptilian tactile spots disappeared. Their function was replaced by hair follicles which appeared first in mammalian skin (the amphibia have no hair). If one can picture to himself a point on mammalian skin where this transformation has not taken place completely, a point where hair follicles have appeared but where reptilian tactile spots have not disappeared, one has a fair picture of the pigmented mole. The human mole, they contend, is part mammalian and part reptilian. "In its hair follicles it is mammalian; in its pigmentation, elevation and in the groups of innervated tactile cells in the corium it follows the amphibian-reptilian pattern." Only in the reptilian tactile spot, they say, does one find a full length portrait of the human pigmented mole: a pigmented elevation of the skin and a nerve coming up from below to innervate a group of tactile cells in the corium. Since the genes of the impregnated ovum contain the hereditary factors of many different types of animals, or, according to the better known phraseology, the individual recapitulates the history of the race, one should seek the anlage of the mole early in the development of the human fetus. The embryo should be examined in the stage when it has not yet diverged greatly from the form and potencies of the reptilian type.

If the work of Laidlaw and Murray is accepted, the mole is to be considered ontologically as derived from both mammalian and reptilian sources. Its origin is pushed back in time by advancing phylogenists, from the whiskers of the cat and lion to the spots on the skin of the alligator.

If nature, then, is consistent, and an atavistic organ indicates a persisting resemblance to the earlier form of life, the more moles one has the more amphibious one should be.

A point for consideration is, should this be taken in account in selecting one's life work? Ought vocational psychologists to prescribe the sea, for example, as the best environment for expression of the talents of a man with a number of elevated hairy moles?

## CALCIUM IN DIABETES

The most publicized minerals in medicine today are probably calcium, iron, and iodine: calcium deficiency is familiarly associated with rickets, iron with anemia, and iodine with goiter. There is a prodigious literature of calcium metabolism; the various steps by which this element is retained in the blood stream or deposited in physiological amounts in the bones and teeth or lost from the body, have been extensively analyzed. Diabetes, which has been considered a disease of carbohydrate metabolism and pancreatic deficiency, is emerging as a serious disorder of calcium metabolism as well. Since the true cause of diabetes is still unknown, it is well to look into the efficiency of the diabetic's assimilation of calcium. It is conceivable that a calcium disorder precedes the more notable change following which sugar appears in the urine.

The most apparent evidence of disturbance in calcium metabolism of diabetics is to be observed in the teeth. Rapid dental caries is common in uncontrolled diabetes, and in patients who have been allowed to go into coma it is often extreme. An instance is reported of a diabetic boy who had lost all his teeth by the age of seventeen.[1] In controlled diabetics on an adequate diet, on the contrary, healing of dental caries is often observed. Before the insulin era a negative calcium balance, or daily loss of this mineral from tissues, believed to be due to the acidosis, was demonstrated. Hardening of the arteries, usually associated with aging, is a constant accompaniment of untreated diabetes, even in the young. According to Shields Warren,[2] it invariably develops in uncontrolled diabetes; and it was observed at necropsy in all patients who had had the disease for five years without adequate insulin treatment. Calcification of the arteries is very common in diabetes of long standing. Calcified nodules under the skin are reported, with other localized deposits. At the same time that these abnormal concretions are forming, the bones often show a calcium drain. Root, White, and Marble,[1] of Joslin's Clinic, in Boston, quote in-

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2. Warren, Shields: The Pathology of Diabetes Mellitus. Philadelphia: Lea & Febiger, 1930.

stances of extreme fragility of bones, including two cases of crushing fractures of the vertebrae, which could almost be called spontaneous, and other fractures which occurred after a slight injury, as for example, after raising and lowering the feet on a bath mat. Thinning of the bones was often detected by the Boston investigators. Among one hundred x-rays of diabetics, 11 per cent showed actual atrophy of bone.

In rickets, abnormal calcium metabolism is apt to be associated with abnormal phosphorus metabolism, and both are controlled by the same vitamin, vitamin D. In diabetes, a change in the phosphorus balance of the body, as well as in the calcium, is manifest. When carbohydrate is burned during muscular contraction, a proportional quantity of phosphoric acid is formed in the muscles. When glucose is taken by mouth, the blood phosphorus decreases. After insulin is given, the fall in blood phosphorus runs about parallel with the fall in blood sugar. Urinary excretion of phosphorus at the same time almost completely ceases, to be followed later by a period of increased phosphorus excretion. It is apparent that the administration of insulin produces as immediate characteristic changes in the phosphorus equilibrium of the body as it does in the carbohydrate.[1]

In guiding the treatment of the diabetic, the mineral balance should be watched closely. The warning has been sounded by dieticians that the commonest deficiency of the average American dietary is in calcium. This with the increased liability to calcium loss or disturbance in diabetes makes it particularly necessary to estimate the calcium supply. Loss of this element from the bones, which is apparently an imminent peril, and at the same time abnormally localized deposits elsewhere, are to be expected in diabetes, unless proper safeguards are taken to stabilize this essential body component.

It is worthy of note that so far no excessive number of kidney calculi have been reported in diabetics, though gallstones (cholesterol) and pancreatic calculi have been observed to occur in a greater proportion of diabetics than in the population at large.

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## GLEANINGS FROM RECENT JOURNALS

*Dietary Zinc.*—McCollum[1] and his coworkers of Johns Hopkins University showed some years ago that minute quantities of manganese were necessary for normal reproduction in the rat. Their experiments were interesting not merely for the results noted, but for the extreme care and precision of chemical technic necessary to provide a diet and environment deficient in this "trace element" of normal nutrition. Another of the inorganic constituents of the earth, rarely thought of as having any function in animal physiology, is zinc. It is also difficult to remove this element from an animal's ration and cage. It has apparently been accomplished, however, by investigators at the University of Wisconsin. Todd, Elvehem and Hart[2] note that animals on a zinc deficient diet grow poorly, and the hair about their necks and shoulders is thin or missing. The ventral surface may be entirely hairless. Addition of zinc to the diet accelerated the rate of growth and permitted the development of a normal coat of hair. Zinc deficiency is thus to be contemplated as of some significance in localizing the growth of hair of these animals.

*Liver Concentrate in Cirrhosis of the Liver.*—A case of cirrhosis with considerable anemia is reported by Goldhamer,[3] of Ann Arbor. The blood picture improved considerably after intravenous injections of liver extract. It is suggested that one of the possible causes of anemia may be the failure of a damaged liver to store anti-anemic substance. If this is true, the author suggests, in a liver disease such as the above, frequent injections of the extract are advisable.

*Vitamin B in the Production of Gastric Achlorhydria.*—The importance of the vitamins in the maintenance of normal gastro-intestinal motility and secretion has been suggested by various studies. Menville, Ane and Blackberg,[4]

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of Tulane University, observed that rachitic rats developed a hypomotility of the intestinal tract which did not return to normal after vitamin D was restored and the rachitic lesions were healed. Rickets is associated with an increased alkalinity of the intestinal content. It has been shown that gastric motility is depressed in the absence of vitamin B,[1] and Cowgill and Gilman,[1] of Harvard University, have lately studied the effect of vitamin B deficiency on the stomach secretion of dogs with Pavlov pouches. Two of four dogs on the deficient ration developed a true achlorhydria. No acid was secreted after histamine stimulation. Further studies suggested that the depression of hydrochloric acid secretion was due to the absence of the antineuritic portion of the vitamin B complex, not to the heat stabile vitamin $B_2$ or G, the pellagra-preventive factor of Goldberger. Webster and Armour,[2] of McGill University, likewise report that vitamin B is essential to the activity of the gastric glands.

Pernicious anemia has never been produced experimentally. It is believed, however, to be dependent upon a dietary deficiency. It is, of course, preceded by a long period of gastric achylia. Vitamin B deficiency, through its possible depression of secretion of hydrochloric acid in the stomach, offers a conceivable mechanism for development of this disease.

The etiological relationship of vitamin deficiency to several of the well known gastrointestinal diseases, is continually being emphasized.

1. Cowgill, G. R.; and Gilman, A.: Physiology of Vitamins: The Effect of Lack of the Vitamin B Complex on the Secretion of Gastric Juice in Dogs with Gastric Pouches. Arch. Int. Med., 53:58, Jan., 1934.

2. Webster, D. R.; and Armour, J. C.: Vitamin B Complex and Gastric Secretion. Proc. Soc. Exper. Biol. & Med., 31: 463, Jan., 1934.

3. Davis, J. D. S.: Report of a Case of Urethral Transplantation. Sou. Med. Jour., 2:557, 1909.

## TWENTY-FIVE YEARS AGO

### From Journals of 1909

*Successful Transplantation of a Section of Calf Urethra into a Human.*[3]—"On May the 6, 1907, I made a preliminary report on the operation for transplanting a section of calf's urethra (four inches) before the Jefferson County Medical Society of Birmingham.

"I am now making a final report of the case, as the patient has gotten entirely well. . . .

"Though the technic was somewhat faulty, the immediate and remote results have been satisfactory.

"Dr. Cook, who sent the patient to my clinic and has seen him constantly, told me last week the man was entirely well, the fistula having closed over a year ago."

*Technic of Thyroid Operation.*[1]—"Whether to make use of a general anesthetic or not in operations upon goiter is rather a mooted point. . . . Charles Mayo, of this country, while in his earlier work he employed local anesthetic to some extent, has latterly practically abandoned its use. He uses the reverse Trendelenberg position with a small roll under the neck and ether anesthesia."

*Cattell on Effects of Higher Education.*[2]—" 'Among the educated and well-to-do classes the number of children does not nearly suffice to continue the race. The Harvard graduate has on the average seven-tenths of a son, the Vassar graduate has one-half of a daughter.' . . .

"The Columbia psychologist [Cattell] considers it largely a consequence of actual loss of reproductive power from overeducation. . . . In his opinion . . . many women are made incapable of bearing children from overeducation, while one in four cannot now nurse her children. . . . It is probably not an exaggeration to say that to the average cost of each girl's education through the high school must be added one unborn child."

*Cancer Serum.*[3]—"The address of Crile before the surgical section of the American Medical Association last June aroused great enthusiasm and raised hope high that an early diagnostic test and a cure of cancer was about to be discovered in the hemolytic reaction of cancer serum and the prophylactic effects of transfusion of normal blood. Weil has recently, as a result of his own investigations along these lines, raised some doubt concerning the value of these tests, but Crile's work has been so painstaking and his promises hitherto so cautious that we shall not abandon hope."

*Doubtful Advertising Matter.*[4]—"After eight months we feel that we will be excused for calling attention of the physicians of this country to the fact that we have thoroughly demonstrated that a journal can be published and live

1. Baker, J. Norment: The Surgical Treatment of Exophthalmic Goiter. Gulf States Jour. Med. & Surg. and Mobile Med. & Surg. Jour., 14:130, March, 1909.

2. Editorial, Education and the Family. J.A.M.A., 52:475, 1909.

3. Parham, F. W.: Conservative Surgery, Then and Now. Sou. Med. Jour., 2:547, March, 1909.

4. Editorial, Sou. Med. Jour., 2:595, 1909.

without taking doubtful advertising matter or catering to questionable means of support."

*Policy of the Gulf States Journal of Medicine and Surgery.*[1]—"In outlining the policy we desire to say that we shall endeavor most earnestly to promote the interests of the entire medical profession of the South, particularly of the states of Alabama, Mississippi and Florida, in which states reside most of our subscribers. We believe that the medical profession of the South compares favorably with that of any other section of our country; we believe that Alabama has as able men in medicine and surgery as any other state; and we also believe that there is as good talent in Mobile, in proportion to the number of physicians, as in New York or Chicago. One reason why the South, why Alabama and why Mobile has not the same reputation in medicine and surgery as, for instance, New England, Massachusetts and Boston, has been that our physicians have not been such prolific writers as our Eastern contemporaries. Our physicians have been able and practical, but we have not contributed our share to medical history simply because the work done by Southern men has not been recorded in medical journals."

1. Editorial. Gulf States Journal of Medicine and Surgery, 14:168, 1909.

# Book Reviews

*The Interpretation of Dreams.* By Prof. Sigmund Freud, M.D., LL.D. Authorized Translation by A. A. Brill, Ph.B., M.D., Lecturer on Psychoanalysis and the Psychosexual Sciences at Columbia University, New York. New edition completely revised. 600 pages. New York: The Macmillan Company, 1933. Cloth, $5.00.

In this latest revised edition of "The Interpretation of Dreams" the author has brought this most interesting work up to date. The review of the scientific literature on this subject is interesting, but is probably of very little practical importance, because Freud in his analysis of dreams has discarded practically all of the old school ideas of dreams and their interpretation.

There is an analysis of a specimen dream, with a study of dream interpretation, which covers twenty-four pages; next a study of the dream as wish-fulfillment, followed by a detailed study of the different types of dreams, the source of dreams and the psychology of dream processes.

A large part of the case material is made up of the author's personal dreams and his conclusions after analysis of these. One will find this a very interesting reference should he care to attempt to explain his own dreams.

*Psychoanalysis and Medicine.* A Study of the Wish to Fall Ill. By Karin Stephen, M.A., M.R.C.S., L.R.C.P., Sometime Fellow of Newnham College, Cambridge. 238 pages. New York: The Macmillan Company, 1933. Cloth, $2.50.

Dr. Stephen has made a very thorough exposition of the structure and dynamics of the human mind. There is a practical and non-technical distinction between mental or psychogenic and physical causes of illness. The operation of disappointment and repression in laying the foundation and the wish to fall ill is described.

The other studies in the eight chapters are the psychoanalytic technic, primitive sexual nature, infantile pleasure seeking, creation, phallic pleasure seeking, the Oedipus complex, anxiety and defense mechanisms.

The non-technical presentation of this study, yet its thorough exposition of the principles and practice of psychoanalysis, make it a valuable work to the medical profession and the student. The average physician's knowledge of this subject is too often a handicap to him and his patient.

*Surgical Anatomy.* By Grant Massie, M.B., M.S. (Lond.), F.R.C.S. (Eng.), Assistant Surgeon, Guy's Hospital; Surgical Tutor, Guy's Hospital Medical School; Examiner in Anatomy for the Fellowship of the Royal College of Surgeons of England; Late Senior Demonstrator of Anatomy, Guy's Hospital Medical School. Second Edition. 458 pages with 147 illustrations, many in color. Philadelphia: Lea & Febiger, 1933. Cloth, $6.00.

Massie has bettered a good text of surgical anatomy with this edition. Although comparatively small, this book contains most of the principles of the best surgical practice combined with the anatomical facts. While the whole book has been revised and added to, the most important additions deal with injuries of the carpus, hand infections and surgical approaches to certain of the long bones. The illustrations have been increased in number and are drawn to emphasize the points under discussion.

*Pathogenic Micro-organisms.* By William Hallock Park, M.D., Professor of Bacteriology and Hygiene, University and Bellevue Hospital Medical College and Director of the Bureau of Laboratories of the Department of Health, New York City, and Anna Wessels Williams, M.D., Assistant Director of the Bureau of Laboratories of the Department of Health, New York City. Tenth Edition, enlarged and thoroughly revised. 867 pages with 215 engravings and 11 full-page plates. Philadelphia: Lea & Febiger, 1933. Cloth, $7.00.

By frequent revisions this complete and practical textbook of bacteriology has been kept up to date. In this edition, much new material has been added. The authors have included their experience with active immunization against diphtheria and scarlet fever. The comprehensive summary table which is a feature of this text has been extensively revised. All phases of bacteriology are presented to the reader: experimentation, classification and isolation of organisms, and finally application of bacteriologic methods to the examination of water, soil and air.

BOOK REVIEWS continued on page 281

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BEXAR COUNTY MEDICAL SOCIETY, San Antonio, Texas—Host to the Southern Medical Association, Twenty-Eighth Annual Meeting, November 13-16, 1934.

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*Finance*—Dr. Charles S. Venable
*Entertainment*—Dr. Lee Rice
*Program or Clinics*—Dr. Wm. D. Gill
*Hotels and Meeting Places*—Dr. H. O. Wyneken
*Publicity*—Dr. P. I. Nixon
*Exhibits*—Dr. Frederick Fink
*Alumni Reunions and Fraternity Luncheons*—Dr. Herbert Hill
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*Transportation*—Dr. W. H. Heck
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*Golf*—Dr. George Paschal
*Trap Shooting*—Dr. R. S. Adams
*Women Physicians*—Dr. Minnie O'Brien

# Book Reviews

Continued from page 279

*Hygiene of the Mind.* By Baron Ernst von Feuchtersleben. Translated from the German by F. C. Sumner, Ph.D., Professor of Psychology, Howard University, with an introduction by Dr. Esther Loring Richards. 148 pages. New York: The Macmillan Company, 1933. Cloth, $1.25.

This translation of a century-old book is particularly apt in view of the present interest in mental hygiene. These essays display an intimate knowledge of the human intellect and its vagaries. They are remarkably prophetic in that they presage the study of this subject and except for terminology would be accepted as examples of modern thought. An earnest study of these writings will enable the practitioner to look beyond the disease and see the patient as an entity instead of a symptom-complex.

*Birth Control in Practice.* By Marie E. Kopp, Ph.D. Prepared under the supervision of a Scientific Advisory Committee. With a Foreword by Adolf Meyer, M.D. 290 pages. New York: Robert M. McBride Co., 1933. Cloth, $3.75.

This book presents a very thorough statistical study, with deductions, of 10,000 case records compiled by the staff of the Birth Control Clinical Research Bureau of New York City. The clinic is operated by a number of physicians under the directorship of Mrs. Margaret Sanger. The 10,000 patients whose case records furnish the basis of the study were admitted to the clinic during the period from January, 1925, to July, 1929. One is impressed by the broad scope of the data obtained and recorded on each case and by the careful analysis of this material as it is presented in this volume.

The physician who is concerned with the problem of birth control as it relates to his practice will find an interesting and instructive statistical study of the application of the various contraceptive methods and of their absolute and comparative efficacy.

*The Rockefeller Foundation Annual Report, 1932.* 455 pages. New York: The Rockefeller Foundation.

The report this year shows an increased activity in research rather than in buildings and endowments which marked the first years of the Foundation. Yellow fever vaccination is looked upon as a continued success. Malaria control is turning to an eradication program rather than one of medication prophylaxis. The usual treasurer's report is appended.

*Diet and Health.* By Milton T. Hanke. 236 pages. Chicago: The University of Chicago Press, 1933.

In the first part of the book the reader is given a concept of dental structures and dental diseases. Dental caries, gingivitis and pyorrhea are discussed and each of these defects is illustrated by color photographs or microphotographs. A chapter is devoted to scurvy.

The diet discussed consists of eight ounces of orange juice plus the juice of one-half a lemon; eight to thirty-two ounces of milk; one or two eggs; one-quarter to one-half head of lettuce; half a pound of fruit; and one pound of vegetables and meat once daily. The amount of orange juice can be quadrupled in cases of acute ulcerative gingivitis. A number of case reports of private patients is included in this section.

Elaborate controlled experiments conducted with children at Mooseheart are reported in detail. The work shows a thoroughness which is quite convincing.

# Southern Medical News

## DALLAS SOUTHERN CLINICAL SOCIETY

The Dallas Southern Clinical Society, Sixth Annual Spring Clinical Conference, will be held in Dallas, Texas, Monday through Friday, March 26-30, at the Baker Hotel. There will be five full days of addresses, hospital clinics, round table luncheons, clinico-pathological conferences, symposia, postgraduate lectures, scientific exhibits and other features, centering about fourteen distinguished guest speakers and clinicians. A single registration fee of $10.00 covers everything, including the daily round table luncheons and the Clinic banquet. Prospectus and final program can be secured from the Secretary, Dr. W. G. Reddick, 610 Medical Arts Building, Dallas, Texas.

## AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY

The American Laryngological, Rhinological and Otological Society will meet in Charleston, South Carolina, April 3, 4 and 5, with headquarters at the Francis Marion Hotel. The scientific sessions will be held only in the forenoons, from 9:00 a. m. to 1:30 p. m., the afternoons and evenings being given over to social diversions. Among the entertainments will be a visit to the gardens, a special harbor excursion, a concert by the Society for the Preservation of Negro Spirituals, and a real Southern barbecue. The visiting ladies on one morning will be shown the famous gardens in the city, and on another they will be taken to see the interiors of several of the old Charleston homes, and there will also be special luncheons, teas and receptions.

The scientific program is to be of unusual interest. Many of the subjects, especially some of the nutritional studies, will appeal to the general practitioner. The medical profession as a whole is cordially invited to attend all the scientific sessions.

Only once before in its history has the American Laryngological, Rhinological and Otological Society held its annual meeting in the South. Among the physicians in the South who have been its Presidents are the late Dr. J. A. Stucky, of Lexington, Kentucky; Dr. Dunbar Roy, of Atlanta, Georgia; and Dr. Joseph A. White, of Richmond, Virginia. The President this year is another well known member of the Southern Medical Association, Dr. J. W. Jervey, of Greenville, South Carolina.

## ALABAMA

The Hillman Hospital, Birmingham, held a series of clinics the week of January 22, which physicians of Alabama were invited to attend. A week of clinics will be held twice yearly by the Hospital, in mid-winter and in mid-summer.

Dr. S. B. McPheeters, formerly with the State Department of Health, Montgomery, has moved to Charlotte, North Carolina, and opened offices in the Medical Arts Building for private practice.

The Coffee County Medical Society has elected the following officers for the coming year: Dr. A. T. Colley, Enterprise, President; Dr. C. P. Hayes, Elba, Vice-President; and Dr. W. A. Lewis, Enterprise, Secretary-Treasurer.

The Cullman County Medical Society has elected the following officers for the coming year: Dr. J. G. Daves, President; Dr. R. B. Dodson, Vice-President; and Dr. M. S. Whiteside, Secretary-Treasurer; all of Cullman.

The Jefferson County Medical Society has elected the following officers for the coming year: Dr. George S. Graham, President; Dr. Kyle J. Kinkead, Vice-President; and Dr. W. B. Hardy, Secretary; all of Birmingham.

The Lawrence County Medical Society has elected the following officers for the coming year: Dr. J. F. Huey, Hillsboro, President; Dr. J. A. Ussery, Courtland, Vice-President; and Dr. R. E. Harper, Moulton, Secretary-Treasurer.

The Marengo County Medical Society has elected the following officers for the coming year: Dr. C. J. Stallworth, Thomas-

ton, President; Dr. D. C. Cameron, Faunsdale, Vice-President; and Dr. Gerald N. Williams, Linden, Secretary-Treasurer.

The Montgomery County Medical Society has elected the following officers for the coming year: Dr. John Branch, President; Dr. Harold Watkins, Vice-President; Dr. J. L. Bowman, Secretary; and Dr. F. C. Stevenson, Treasurer; all of Montgomery.

The Russell County Medical Society has elected the following officers for the coming year: Dr. Clarence Long, Hurtsboro, President; Dr. Seth J. Floyd, Phoenix City, Vice-President; and Dr. John Prather, Seale, Secretary-Treasurer.

The Tuscaloosa County Medical Society has elected the following officers for the coming year: Dr. Ralph McBurney, re-elected President; Dr. J. S. Tarwater, Vice-President; and Dr. C. C. Belcher, Secretary-Treasurer; all of Tuscaloosa.

The Winston County Medical Society has elected the following officers for the coming year: Dr. Thomas M. Blake, Double Springs, President; Dr. C. A. Olivet, Haleyville, Vice-President; and Dr. W. E. Howell, Haleyville, Secretary-Treasurer.

### Deaths

Dr. Larcus B. Allen, Alexander City, aged 46, died November 18 of Hodgkin's disease.

Dr. Thomas Emilo Snoddy, Russellville, aged 32, died January 5 of pneumonia.

Dr. Frank Reid Yarbrough, Auburn, aged 61, died December 21 of heart disease.

## ARKANSAS

Dr. Henry F. DeWolf, formerly of Cleveland, Ohio, has located at Little Rock, with offices in the Donaghey Building, for the practice of dermatology and syphilology.

Dr. I. R. Johnson, Blytheville, is in New York doing special work in internal medicine at the New York Polyclinic.

Dr. Ira Ellis, Monette, was recently installed as Grand Sentinel of the Grand Chapter of the Arkansas Order of the Eastern Star.

The Cotton Belt Lines Medical Association at a recent meeting elected the following officers for the coming year: Dr. E. D. McKnight, Brinkley, President; Dr. I. R. Johnson, Blytheville, Vice-President for Arkansas; and Dr. Wm. Hibbitts, Texarkana, reelected Secretary-Treasurer.

The Benton County Medical Society has elected the following officers for the coming year: Dr. C. S. Wilson, Siloam Springs, President; Dr. L. O. Greene, Pea Ridge, Vice-President; and Dr. E. A. Pickens, Bentonville, Secretary-Treasurer.

The Crawford County Medical Society has elected the following officers for the coming year: Dr. Odell J. Kirksey, Mulberry, President; Dr. B. B. Bruce, Alma, Vice-President; and Dr. S. D. Kirkland, Van Buren, reelected Secretary-Treasurer.

The Faulkner County Medical Society has elected the following officers for the coming year: Dr. A. J. Glover, Guy, President; Dr. Louis H. Dunaway, Conway, Vice-President; and Dr. J. S. Westerfield, Conway, Secretary-Treasurer.

The Monroe County Medical Society has elected the following officers for the coming year: Dr. W. H. Martin, Holly Grove, President; Dr. M. L. Dalton, Brinkley, Vice-President; and Dr. C. A. Henry, Clarendon, Secretary.

The Sebastian County Medical Society has elected the following officers for the coming year: Dr. I. F. Jones, Fort Smith, President; Dr. B. L. Ware, Greenwood, Vice-President; Dr. J. W. Amis, Fort Smith, Secretary; and Dr. W. R. Brooksher, Fort Smith, Treasurer.

The Sevier County Medical Society has elected the following officers for 1934: Dr. J. C. Graves, Lockesburg, President; Dr. B. E. Hendrix, Gillham, Vice-President; and Dr. I. G. Jones, DeQueen, Secretary-Treasurer.

The Union County Medical Society has elected the following officers for the coming year: Dr. L. A. Purifoy, El Dorado, President; Dr. W. L. Newton, Smackover, Vice-President; and Dr. F. L. Irby, El Dorado, Secretary-Treasurer.

The Washington County Medical Society has elected the following officers for 1934: Dr. Preston L. Hathcock, Fayetteville, President; Dr. C. P. Cisco, Springdale, Vice-President; and Dr. Fount Richardson, Fayetteville, Secretary-Treasurer.

## DISTRICT OF COLUMBIA

The second annual Postgraduate Clinic of the School of Medicine, the George Washington University, Washington, was held in February at the Gallinger Municipal Hospital and the Hospital and Medical School of the University.

Dr. Buckner M. Randolph has returned to Washington to locate after being recently located in Charlottesville, Virginia, for practice.

Dr. Herbert H. Schoenfeld, Washington, has moved into new offices in The Connecticut, with practice limited to surgery.

The Washington Academy of Surgery has elected the following officers for 1934: Dr. H. H. Kerr, President; Dr. F. R. Sanderson, Vice-President; and Dr. Alec Horwitz, Secretary-Treasurer; all of Washington.

The Medical Review Club has elected the following officers for 1934: Dr. Harold A. Krogh, President; Dr. Leroy L. Sawyer, Jr., Vice-President; and Dr. Alan J. Chenery, Secretary-Treasurer; all of Washington.

## FLORIDA

Dr. J. D. Bell, Pensacola, has recently returned from Chicago, where he did some special work in the Chicago Lying-In Hospital, and is now specializing in obstetrics.

Dr. Frank W. Foxworthy has moved into new offices in The Bastian Building at Miami Beach.

Dr. William S. Manning, Jacksonville, has moved into new offices in the Greenleaf-Crosby Building.

Dr. Jack Q. Cleveland has located at Coral Gables for general practice, with offices in the Karp Building.

Dr. S. J. Simmons has moved from Arcadia to Belle Glade.

Dr. Henry E. Palmer, Tallahassee, is the newly elected President of the Seaboard Air Line Railway Surgeons' Association.

Dr. Harry C. Galey, Key West, has been appointed to succeed Dr. George R. Plummer, deceased, as Necrologist for the Twentieth Councilor District.

Dr. Stephen Gyland, formerly of Brewster, associated with the Medical Department of the American Cyanamid Company, has moved to Tampa and opened private offices.

Dr. R. L. Hughes, Bartow, has been appointed to succeed Dr. Leland Dame, resigned, as a member of the State Board of Health.

The Hillsboro County Medical Society has elected the following officers for 1934: Dr. E. S. Gilmer, President; Dr. G. C. Bottari, Vice-President; and Dr. John S. Helms, Jr., Secretary-Treasurer; all of Tampa.

The Palm Beach County Medical Society has elected the following officers for 1934: Dr. William Y. Sayad, President; Dr. Bailey B. Sory, Jr., Vice-President; Dr. R. Henry Baldwin, Secretary; and Dr. Frederick K. Herpel, Treasurer; all of West Palm Beach.

The Pasco-Hernando-Citrus County Medical Society has elected the following officers for 1934: Dr. P. J. Hudson, Crystal River, President; Dr. Claude Anderson, Dade City, First Vice-President; Dr. S. C. Harvard, Brooksville, Second Vice-President; and Dr. George R. Creekmore, Brooksville, Secretary-Treasurer.

The Polk County Medical Society has elected the following officers for 1934: Dr. H. B. Cordes, Frostproof, President; Dr. H. M. Richards, Lakeland, Vice-President; and Dr. J. R. Boulware, Jr., Lakeland, Secretary-Treasurer.

The Seminole County Medical Society has elected the following officers for 1934: Dr. A. W. Knox, President; Dr. C. L. Park, Vice-President; and Dr. J. T. Denton, Secretary-Treasurer; all of Sanford.

### Deaths

Dr. George P. Morris, DeFuniak Springs, aged 83, died December 24 of chronic interstitial nephritis.

Dr. William Bond Winkler, Fort Myers, aged 76, died October 31.

Dr. George Rochefoucauld Plummer, Key West, aged 62, died December 31.

Dr. Leon Ashley Peek, West Palm Beach, aged 58, died January 5 of cardiorenal disease.

Dr. Thomas David Gunter, West Palm Beach, aged 60, died December 25.

Dr. Emory Willis Peery, West Palm Peach, aged 67, died December 4 of cerebral arteriosclerosis.

## GEORGIA

The Bartow County Medical Society has elected the following officers for 1934: Dr. R. E. Adair, President; Dr. W. C. Wofford, Vice-President; and Dr. J. W. Stanford, Secretary-Treasurer; all of Cartersville.

The Bulloch-Candler-Evans Counties Medical Society has elected the following officers for 1934: Dr. J. Wallace Daniel, Claxton, President; Dr. Waldo E. Floyd, Statesboro, Vice-President; and Dr. Walter E. Simmons, Metter, Secretary-Treasurer.

The Clarke County Medical Society has elected the following officers for 1934: Dr. G. O. Whelchel, President; Dr. M. A. Hubert, Vice-President; and Dr. H. B. Harris, Secretary-Treasurer; all of Athens.

Continued on page 22

THROAT affections are usually more prevalent during winter months and the physician frequently needs alleviating agents.

Thantis Lozenges were developed for use in the treatment of infections and irritations of the throat and mouth.

The lozenges contain Merodicein, 1/8 grain, and Saligenin, 1 grain, and combine antiseptic and anesthetic action. Low toxicity of the two ingredients permits frequent use and therefore almost continuous treatment of the affected regions.

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Continued from page 282

The Emanuel County Medical Society has elected the following officers for 1934: Dr. J. H. Chandler, Swainsboro, President; Dr. V. E. Franklin, Graymont, Vice-President; and Dr. R. C. Franklin, Swainsboro, Secretary-Treasurer.

The Floyd County Medical Society has elected the following officers for 1934: Dr. B. V. Elmore, President; Dr. R. M. Harbin, Vice-President; and Dr. J. H. Mull, Secretary-Treasurer; all of Rome.

The Fulton County Medical Society has elected the following officers for 1934: Dr. Marion C. Pruitt, President; Dr. E. D. Shanks, President-Elect; Dr. Mark S. Dougherty, Vice-President; and Dr. M. T. Harrison, Secretary-Treasurer; all of Atlanta.

The Georgia Medical Society (Chatham County) has elected the following officers for 1934: Dr. H. L. Levington, President; Dr. M. J. Egan, President-Elect; Dr. J. J. Epting, Vice-President; and Dr. O. W. Schwab, Secretary-Treasurer; all of Savannah.

The Hall County Medical Society has elected the following officers for 1934: Dr. L. W. Hodges, Gainesville, President; Dr. W. K. Phillips, Cleveland, Vice-President; and Dr. W. R. Garner, Gainesville, Secretary-Treasurer.

The Jackson-Barrow Counties Medical Society has elected the following officers for 1934: Dr. S. T. Ross, Winder, President; Dr. L. C. Allen, Hoschton, Vice-President; and Dr. J. C. Bennett, Jefferson, Secretary-Treasurer.

The Jefferson County Medical Society has elected the following officers for 1934: Dr. L. R. Bryson, President; Dr. S. C. Ketchin, Vice-President; and Dr. S. T. R. Revell, Secretary-Treasurer; all of Louisville.

The Jenkins County Medical Society has elected the following officers for 1934: Dr. M. E. Perkins, President; Dr. H. G. Lee, Vice-President; and Dr. C. Thompson, Secretary-Treasurer; all of Millen.

The Lowndes County Medical Society has elected the following officers for 1934: Dr. J. P. Prescott, Lake Park, President; Dr. S. B. Ellis, Valdosta, Vice-President; and Dr. T. C. Williams, Valdosta, Secretary-Treasurer.

The Macon County Medical Society has elected the following officers for 1934: Dr. D. B. Frederick, Marshallville, President; and Dr. Thomas M. Adams, Montezuma, Secretary-Treasurer.

The Macon Medical Society (Bibb County) has elected the following officers for 1934: Dr. A. R. Rozar, President; Dr. C. Hall Farmer, Vice-President; and Dr. Leon D. Porch, Secretary-Treasurer; all of Macon.

The Muscogee County Medical Society has elected the following officers for 1934: Dr. W. F. Jenkins, President; Dr. C. A. Peacock, Vice-President; and Dr. Arthur N. Berry, Secretary-Treasurer; all of Columbus.

The Spalding County Medical Society has elected the following officers for 1934: Dr. H. J. Copeland, President; Dr. W. H. Austin, Vice-President; and Dr. W. C. Miles, Secretary-Treasurer; all of Griffin.

The Talbot County Medical Society has elected the following officers for 1934: Dr. J. E. Peeler, Woodland, President; and Dr. W. P. Leonard, Talbotton, Secretary-Treasurer.

The Telfair County Medical Society has elected the following officers for 1934: Dr. C. R. Youmans, Lumber City, President; Dr. J. K. Fussell, Rhine, Vice-President; and Dr. J. W. Neal, Scotland, Secretary-Treasurer.

The Terrell County Medical Society has elected the following officers for 1934: Dr. Guy Chappell, Dawson, President; Dr. R. R. Holt, Parrott, Vice-President; and Dr. Steve P. Kenyon, Dawson, Secretary-Treasurer.

The Thomas County Medical Society has elected the following officers for 1934: Dr. J. J. Collins, Thomasville, President; Dr. S. E. Sanchez, Barwick, Vice-President; and Dr. H. M. Moore, Thomasville, Secretary-Treasurer.

The Tri-County Medical Society has elected the following officers for 1934: Dr. J. L. Cheshire, Damascus, President; Dr. J. G. Standifer, Blakely, Vice-President; and Dr. C. K. Sharp, Arlington, Secretary-Treasurer.

The Troup County Medical Society has elected the following officers for 1934: Dr. Rance O'Neal, West Point, President; Dr. C. W. Harvey, Hogansville, Vice-President; and Dr. M. M. Byrd, West Point, Secretary-Treasurer.

The Walker County Medical Society has elected the following officers for 1934: Dr. J. S. Alsobrook, Rossville, President; Dr. Fred H. Simonton, Chickamauga, Vice-President; and Dr. O. B. Murray, LaFayette, Secretary-Treasurer.

The Washington County Medical Society has elected the following officers for 1934: Dr. W. M. Cason, Sandersville, President; Dr. Steve B. Malone, Sandersville, Vice-President; and Dr. O. D. Lennard, Tennille, Secretary-Treasurer.

The Crawford W. Long Memorial Hospital, Atlanta, at a recent staff meeting elected the following officers for 1934: Dr. Harold P. McDonald, President; Dr. M. T. Harrison, Vice-President; and Dr. C. E. Lawrence, Secretary.

Dr. W. L. Gilbert, Atlanta, has been elected to succeed Dr. W. N. Adkins, deceased, as Commissioner of Health of Fulton County.

DEATHS

Dr. James Henry McClure, Cornelia, aged 69, died December 7.

Dr. William Nevin Adkins, Atlanta, aged 50, died January 5 of cirrhosis of the liver.

Dr. George Young Moore, Cuthbert, aged 65, died December 24 of cerebral hemorrhage and coronary disease.

Dr. Benjamin Franklin Bond, Savannah, aged 56, died suddenly December 9 of angina pectoris.

Dr. George Lucas Harman, Savannah, aged 62, died December 2 of myocarditis.

Dr. Elliott Lawson Baker, Jr., Columbus, aged 33, died December 4.

Dr. Frank Webb Parks, Brinson, aged 50, died December 16 of heart disease.

Dr. Henry Lonzoe Akridge, Brunswick, aged 43, died December 17.

Dr. William Weaver Stewart, Columbus, aged 68, died December 24.

Dr. John Nathaniel Childs, Ideal, aged 73, died December 29 of heart disease.

Dr. Robert Benjamin Chastain, Calhoun, aged 39, died December 14.

Dr. Logan Lightfoot Thomas, Dawson, aged 68, died December 11.

Dr. Jefferson Davis Wilcox, Willacoochee, aged 77, died December 21 of heart disease.

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KENTUCKY

Dr. Walter Lee O'Nan, Henderson, and Miss Bernice James were married in January.

DEATHS

Dr. Walker F. Cartwright, Columbia, aged 82, died January 9 of arteriosclerosis.

Dr. Ellis Duncan, Louisville, aged 59, died January 6 of cerebral hemorrhage.

Continued on page 24

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Continued from page 22

Dr. John J. Gambill, Jr., Blaine, aged 59, died January 10 of cerebral hemorrhage.

Dr. Asa F. Goodwin, Louellen, aged 55, died suddenly December 25 of cerebral hemorrhage.

Dr. James W. Kincaid, Catlettsburg, aged 74, died December 20 of heart disease.

Dr. John Logan Reynolds, Blackford, aged 71, died December 20 of tuberculosis.

Dr. Vernon Robins, Louisville, aged 61, died January 1 of pulmonary tuberculosis and arteriosclerosis.

## LOUISIANA

Dr. A. A. Herold, Shreveport, has been appointed the member of the Council of the Southern Medical Association from Louisiana for a regular Council term of five years, the appointment having been announced recently by the President, Dr. Hugh Leslie Moore, of Dallas, Texas. Dr. Herold succeeds Dr. Homer Dupuy, New Orleans, who, having served the constitutional limit, was not eligible for reappointment.

Dr. H. W. E. Walther, New Orleans, Head of the Department of Urology, Southern Baptist Hospital, was a guest speaker on the program recently of a joint meeting of the New York Division of the American Urological Association and the Section of Genito-Urinary Surgery of the New York Academy of Medicine.

The Acadia Parish Medical Society has elected the following officers for 1934: Dr. H. L. Gardiner, Crowley, President; Dr. J. P. Parrott, Church Point, Vice-President; and Dr. A. B. Cross, Crowley, Secretary-Treasurer.

The Avoyelles Parish Medical Society has elected the following officers for 1934: Dr. Albert Bordelon, Cottonport, President; Dr. Philip Jeansonne, Plaucheville, Vice-President; and Dr. S. J. Couvillon, Moreauville, reelected Secretary-Treasurer.

The Caddo (Shreveport) Parish Medical Society has elected the following officers for 1934: Dr. W. S. Kerlin, President; Dr. C. P. Rutledge, First Vice-President; Dr. J. G. Yearwood, Second Vice-President; Dr. D. R. McIntyre, Treasurer; and Dr. Paul D. Abramson, Secretary; all of Shreveport.

The East and West Feliciana Bi-Parish Medical Society has elected the following officers for 1934: Dr. C. S. Toler, Clinton, President; Dr. J. B. Stanley, Jackson, Vice-President; and Dr. E. M. Toler, Clinton, Secretary-Treasurer.

The Madison, East Carroll, and West Carroll Tri-Parish Medical Society has elected the following officers for 1934: Dr. G. W. Gaines, Tallulah, President; Dr. W. K. Evans, Lake Providence, Vice-President from East Carroll Parish; Dr. H. C. Sevier, Tallulah, Vice-President from Madison Parish; Dr. B. L. Bailey, Epps, Vice-President from West Carroll Parish; Dr. Joseph Whitaker, St. Joseph, Vice-President from Tensas Parish; and Dr. E. S. Freeman, Tallulah, Secretary and Treasurer.

The Natchitoches Parish Medical Society has elected the following officers for 1934: Dr. J. C. Parrott, Montrose, President; Dr. Joseph Bath, Natchitoches, Vice-President; and Dr. W. W. Knipmeyer, Natchitoches, Secretary-Treasurer.

The Ouachita Parish Medical Society has elected the following officers for 1934: Dr. A. E. Fisher, President; Dr. Irma Jones, Vice-President; and Dr. D. M. Moore, Secretary-Treasurer; all of Monroe.

The St. Tammany Parish Medical Society has elected the following officers for 1934: Dr. Fenwick F. Young, President; Dr. H. E. Gautreaux, Vice-President; and Dr. H. D. Bulloch, Secretary and Treasurer; all of Covington.

The Webster Parish Medical Society has elected the following officers for 1934: Dr. Wilkins McDade, President; Dr. C. S. Sentell, Vice-President; and Dr. B. A. Norman, Secretary-Treasurer; all of Minden.

Dr. G. M. Graham Stafford, Alexandria, and Miss Dorothy Schulze were married recently.

### Deaths

Dr. Henry Allen King, New Iberia, aged 67, died December 8.

Dr. Joseph Alexander Packer, Alexandria, aged 54, died December 2 of heart disease.

Dr. James Wofford Sanders, New Iberia, aged 57, died January 14.

Dr. Michel Shelly Picard, Shreveport, aged 54, died December 31.


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## MARYLAND

The De Lamar Lecture to the faculty and students of Johns Hopkins University, Baltimore, was delivered on January 31 by Dr. W. S. Leathers, Dean of Vanderbilt University School of Medicine, Nashville, Tennessee.

Dr. J. L. Cantor, who has been taking his internship at Bon Secours Hospital, Baltimore, was recently appointed Senior Assistant Resident in Surgery at the West Baltimore General Hospital.

Dr. John Herman Long, Baltimore, and Miss Eleanor Porter Legg were married recently.

### Deaths

Dr. Floyd Leslie Echols, Perry Point, aged 41, died December 25 in a Washington, D. C., hospital.

Dr. Lewis Harry Ephraim, Baltimore, aged 74, died December 16 of chronic myocarditis.

Dr. John Henry Groshans, Baltimore, aged 63, died suddenly January 2 of heart disease.

Dr. William S. Booze, Annapolis, aged 70, died December 6 of heart disease.

Dr. George Clinton Blades, Baltimore, aged 61, died December 29 of diabetes mellitus and myocarditis.

## MISSISSIPPI

Dr. Harvey F. Garrison, Jackson, has been appointed the member of the Council of the Southern Medical Association from Mississippi for a regular Council term of five years, the appointment having been announced recently by the President, Dr. Hugh Leslie Moore, of Dallas, Texas. Dr. Garrison succeeds Dr. Inman W. Cooper, Meridian, who, having served the constitutional limit, was not eligible for reappointment.

Dr. J. M. Hood, Houlka, is the newly elected President of the Northeast Mississippi Thirteen County Medical Society.

Dr. W. J. Aycock and Dr. J. A. Hardin, Derma, have opened offices at Calhoun City, where they will practice in the future.

Dr. B. E. Vowell, Carthage, recently received an award from the Commonwealth Foundation of New York of a four months' fellowship for graduate study at Tulane University, New Orleans.

Dr. Van Dyke Hagaman, Jackson, has reopened his office in the Lamar Building, after spending several months attending clinics in Memphis.

Dr. J. C. Dotson, Carthage, is the newly appointed medical examiner for Veterans' Administration of Leake County.

Continued on page 26

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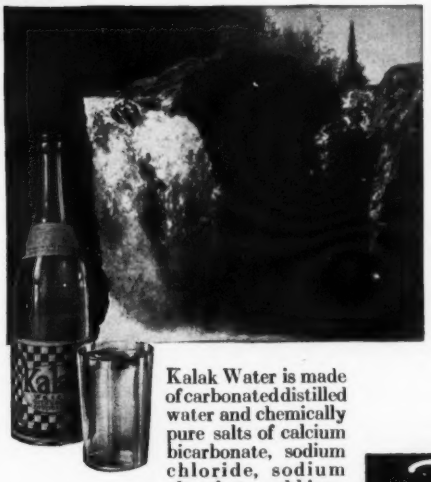

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Continued from page 24

The DeSoto County Medical Society has elected the following officers for 1934: Dr. A. J. Weissinger, President; Dr. J. M. Wright, Vice-President; and Dr. L. L. Minor, Secretary and Treasurer; all of Hernando.

The Pontotoc County Medical Association was organized recently, and the following officers elected for 1934: Dr. R. P. Donaldson, Pontotoc, President; Dr. E. B. Burns, Ecru, Vice-President; and Dr. T. H. Rayburn, Secretary.

The South Mississippi Medical Society has elected the following officers for 1934: Dr. T. E. Ross, Jr., Hattiesburg, President; Dr. J. H. Newcomb, Richton, First Vice-President; Dr. T. R. Beech, Ellisville, Second Vice-President; and Dr. F. T. Bower, Hattiesburg, Secretary and Treasurer.

Dr. Frank T. Bower, Hattiesburg, and Miss Hazel Draughn were married recently.

DEATHS

Dr. Alfred F. Whitehurst, Iuka, aged 65, died suddenly recently.

## MISSOURI

The Mid-Western Section of the American Laryngological, Rhinological and Otological Society held their annual meeting in St. Louis recently.

Drs. E. A. Graham, J. J. Singer, Alfred Goldman, William Tuttle and Duff Allen, all of St. Louis, presented demonstrations of clinical cases before the regular meeting of the St. Louis Trudeau Club recently.

The annual Hodgen Lecture, sponsored by the St. Louis Surgical Society and Medical Fund Society, was presented recently by Dr. Walter B. Cannon, Professor of Physiology, Harvard University.

The Ophthalmic Section of the St. Louis Medical Society sponsored a course in ophthalmology which was given in St. Louis February 13 to 17 by Dr. Anton Elschnig, of Prague, Czechoslovakia.

The Barnard Free Skin and Cancer Hospital, St. Louis, recently received a bequest through the will of the late Mrs. Mary L. Barnard, whose husband founded the hospital.

The Western Surgical Association, at its recent annual meeting, elected Dr. Frank R. Teachenor, Kansas City, President; and Dr. Thomas G. Orr, Kansas City, was reelected Treasurer.

The State Board of Health has reelected its officers for 1934 as follows: Dr. Emmett P. North, St. Louis, President; Dr. P. T. Bohan, Kansas City, Vice-President; and Dr. E. T. McGaugh, Richmond, Secretary.

The Staff of the St. Joseph Hospital, Kansas City, has elected the following officers for 1934: Dr. T. J. Beattie, President; Dr. Harry L. Jones, Chief of Staff; Dr. W. M. Ketcham, Vice-President; Dr. V. T. Williams, Secretary; and Dr. C. S. Capell, Treasurer; all of Kansas City.

The Audrian County Medical Society has elected the following officers for 1934: Dr. J. Frank Jolley, Mexico, President; Dr. W. K. McCall, Laddonia, Vice-President; and Dr. H. C. Brashear, Mexico, Secretary and Treasurer.

The Boone County Medical Society has elected the following officers for 1934: Dr. A. R. McComas, Sturgeon, President; Dr. S. C. Smith, Columbia, Vice-President; and Dr. M. E. Cooper, Columbia, Secretary and Treasurer.

The Cape Girardeau County Medical Society has elected the following officers for 1934: Dr. H. V. Ashley, Cape Girardeau, President; Dr. D. I. L. Seabaugh, Cape Girardeau, Vice-President; Dr. C. A. W. Zimmermann, Cape Girardeau, Secretary; and Dr. B. W. Hays, Jackson, Treasurer.

The Cass County Medical Society has elected the following officers for 1934: Dr. T. W. Adair, Archie, President; Dr. William Beckman, Strassburg, Vice-President; and Dr. J. S. Triplett, Harrisonville, reelected Secretary-Treasurer.

The Clay County Medical Society has elected the following officers for 1934: Dr. Eugene C. Robichaux, Excelsior Springs, President; Dr. Harry R. Staley, North Kansas City, Vice-President; and Dr. J. J. Gaines, Excelsior Springs, Secretary-Treasurer.

The Jasper County Medical Society has elected the following officers for 1934: Dr. E. D. James, President; Dr. W. S. Loveland, Vice-President; Dr. Paul W. Walker, Secretary; and Dr. H. D. McGaughey, Treasurer; all of Joplin.

The Johnson County Medical Society has elected the following officers for 1934: Dr. J. T. Anderson, President; Dr. W. E. Johnson, Vice-President; and Dr. O. B. Hall, Secretary-Treasurer; all of Warrensburg.

The Lawrence-Stone County Medical Society has elected the following officers for 1934: Dr. J. W. Smith, Aurora, President; Dr. L. M. Lyons, Pierce City, Vice-President; and Dr. V. T. Bickel, Aurora, Secretary and Treasurer.

The Pemiscot County Medical Society has elected the following officers for 1934: Dr. L. E. Cooper, Coutre, President; Dr. G. W. Phipps, Caruthersville, Vice-President; and Dr. W. R. Limbaugh, Hayti, Secretary-Treasurer.

The Ray County Medical Society has elected the following officers for 1934: Dr. Harry M. Griffith, Richmond, President; Dr. O. S. Pate, Orrick, Vice-President; and Dr. I. E. Goldberg, Polo, Secretary-Treasurer.

The Ste. Genevieve County Medical Society has reelected their officers for 1934 as follows: Dr. J. A. Wilkins, St. Marys, President; Dr. George M. Rutledge, Ste. Genevieve, Vice-President; and Dr. R. W. Lanning, Ste. Genevieve, Secretary-Treasurer.

The Vernon-Cedar County Medical Society has elected the following officers for 1934: Dr. W. L. Davis, President; and Dr. E. H. Liston, Secretary; both of Nevada.

Dr. Edgar Armistead Belden, Columbia, and Miss Elinore Scanlon were married in January.

DEATHS

Dr. George Francis Berry, Kansas City, aged 66, died January 4 of pneumonia.

Dr. Charles Andrew S. Sims, Kansas City, aged 72, died November 13.

Dr. Ross H. Shepler, Green City, aged 63, died December 16.

Dr. Samuel Ellis, Lees Summit, aged 98, died October 31 of bronchopneumonia and arteriosclerosis.

Dr. William Rufus Hardin, Louisiana, aged 58, died December 11 of asthma and myocarditis.

Dr. James A. Hunter, Fairfax, aged 83, died November 28 of acute hepatitis.

Dr. John J. Farrell, Hannibal, aged 55, died December 3 of cerebral hemorrhage.

## NORTH CAROLINA

The Duke University School of Medicine began its winter quarter in January with sixty first-year students, forty-three second-year students, thirty-three junior-year students, and twenty-seven senior-year students.

The Dunn Memorial Clinic, Asheville, Dr. C. D. W. Colby, Dr. Karl Schaffle and Dr. G. C. Battle, announces its removal to new quarters in the Arcade Building.

Continued on page 28


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When you prescribe these tablets your patient gets in each tablet not less than 1000 units of Vitamin A (U.S.P.) and not less than 500 units Vitamin D (A.D.M.A.). This represents a higher Vitamin A content than is contained in ½ teaspoonful of cod liver oil, conforming in Vitamin A to N.N.R. requirements and having a Vitamin D content of approximately one teaspoonful of cod liver oil containing 133 units (A.D.M.A.) per gram.

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Continued from page 26

Dr. S. B. McPheeters, formerly of Montgomery, Alabama, has located at Charlotte, with offices in the Medical Arts Building, where he will specialize in diseases of the chest.

The Anson County Medical Society has elected the following officers for 1934: Dr. Charles I. Allen, Wadesboro, President; Dr. B. J. McGoogan, Morven, Vice-President; and Dr. F. Y. Sorrell, Secretary-Treasurer.

The Buncombe County Medical Society has elected the following officers for 1934: Dr. A. C. McCall, President; Dr. L. M. Griffith, Vice-President; and Dr. Paul H. Ringer, Secretary-Treasurer; all of Asheville.

The Edgecombe-Nash Medical Society has elected the following officers for 1934: Dr. Ivan P. Battle, Rocky Mount, President; Dr. J. L. Lane, Rocky Mount, First Vice-President; Dr. A. C. Norfleet, Tarboro, Second Vice-President; and Dr. Roy Norton, Rocky Mount, Secretary-Treasurer.

The Sampson County Medical Society has elected the following officers for 1934: Dr. Victor R. Small, President; Dr. John D. Kerr, Vice-President; and Dr. Oscar L. Parker, Secretary; all of Clinton.

Dr. Edward Porcher Brunson, Albemarle, and Miss Charlotte Wilson Miles were married recently.

Dr. Carroll C. Lupton and Miss Clara Mae McAdams, both of Burlington, were married recently.

Dr. Marvin Longworth Slate, High Point, and Miss Marion Wolfersberger were married in December.

### Deaths

Dr. Lee Roy Salmons, Winston-Salem, aged 43, died January 9 of acute dilatation of the heart.

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### OKLAHOMA

Dr. W. K. West, Oklahoma City, has been appointed the member of the Council of the Southern Medical Association from Oklahoma for a regular Council term of five years, the appointment having been announced recently by the President, Dr. Hugh Leslie Moore, of Dallas, Texas. Dr. West succeeds Dr. Lea A. Riely, Oklahoma City, who, having served the constitutional limit, is not eligible for reappointment.

The American College of Surgeons members in Oklahoma, Texas, Arkansas and Missouri held their sectional meeting in Oklahoma City in February.

Dr. L. D. Conn has moved to Webb City to practice.

Dr. J. R. Waltrip, formerly of Coweta, has moved to Yale.

The Beckham County Medical Society has elected the following officers for 1934: Dr. H. K. Speed, Sayre, President; Dr. B. B. Roberts, Erick, Vice-President; and Dr. C. F. Jones, Erick, Secretary-Treasurer.

The Blaine County Medical Society has elected the following officers for 1934: Dr. A. K. Cox, Watonga, President; Dr. J. W. Browning, Geary, Vice-President; and Dr. W. F. Griffin, Watonga, Secretary.

The Bryan County Medical Society has elected the following officers for 1934: Dr. H. B. Fuston, Bokchito, President; Dr. Charles G. Price, Durant, Vice-President; and Dr. John T. Wharton, Durant, Secretary.

The Canadian County Medical Society has elected the following officers for 1934: Dr. Joseph T. Phelps, President; Dr. P. F. Herod, reelected Vice-President; and Dr. Malcom E. Phelps, Secretary-Treasurer; all of El Reno.

The Custer County Medical Society has elected the following officers for 1934: Dr. T. A. Boyd, Weatherford, President; Dr. J. T. Frizzell, Clinton, Vice-President; and Dr. C. Doler, Clinton, Secretary-Treasurer.

The Garvin County Medical Society has elected the following officers for 1934: Dr. Ray H. Lindsey, President; Dr. W. P. Greening, Vice-President; and Dr. John R. Callaway, Secretary-Treasurer; all of Pauls Valley.

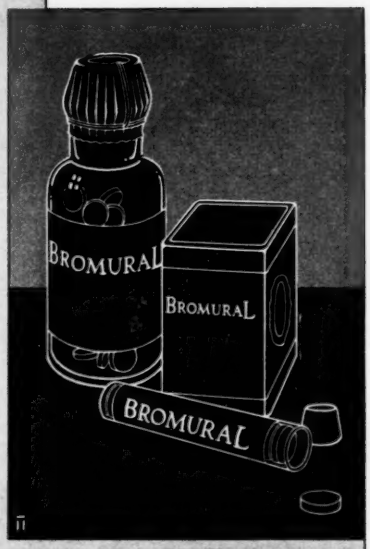
The Hughes County Medical Society has elected the following officers for 1934: Dr. W. M. Taylor, Holdenville, President; Dr. S. H. Hamilton, Non, reelected Vice-President; and Dr. G. W. Diggs, Wetumka, reelected Secretary-Treasurer.

Continued on page 30


# BromuraL

*Alphabromisovalerylcarbamide*

**Council Accepted**




## AS A ROUTINE SEDATIVE

**in general nervous disturbances prescribe one tablet (5 grains) several times a day. As a mild and prompt hypnotic the dose is 2 to 3 tablets upon retiring or during the night. Bromural is not a barbiturate nor a bromide.**

**5 grain tablets and as a powder.**

*Samples and literature upon request.*

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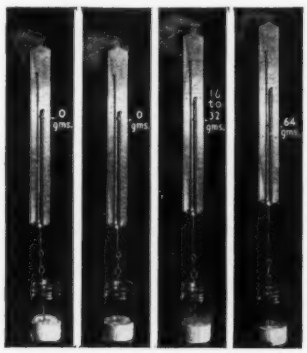
# CURD TENSION

– AND INFANT FEEDING –

ITS · EFFECT · UPON · THE · ASSIMILATION · OF

## PROTEINS



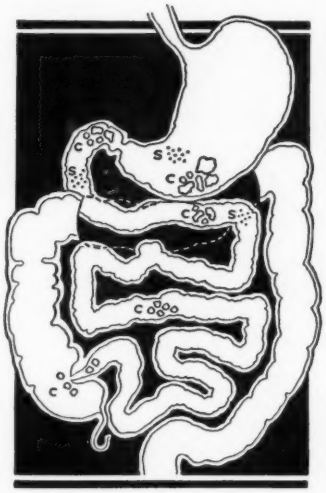

BREAST MILK SIMILAC POWDERED MILK COW'S MILK

"THE most available and the most easily digestible form of protein for infants is the protein of milk. The protein of breast milk is more digestible than that of cow's milk."

"In the light of our present knowledge, the chief cause of the difference in the digestibility of the protein of human milk and that of cow's milk lies in the greater proportion of casein in cow's milk."

"It is the formation of large curds which renders the casein of cow's milk so much more difficult of digestion by the infant than that of human milk. If the formation of large casein curds in the stomach can be prevented, the casein of cow's milk is easily digested."[1]

In SIMILAC the large casein curds are not formed. The curds formed when the gastric enzymes act upon SIMILAC are small and flocculent, registering zero on the tensiometer, as shown in the illustration, hence more easily digested.




C—Cow's milk S—Similac
Schematic drawing of the relative size of the curds of cow's milk and Similac vomited by six weeks old puppies after one-half hour's ingestion.

The finer the curd the greater the surface area. The greater the surface area the more exposed are the fats, carbohydrates, proteins and salts to the digestive enzymes. Result . . . a more complete utilization of the food elements.

[1] Morse and Talbott, Diseases of Nutrition and Infant Feeding, pgs. 214, 215.

*Samples and literature will be sent on receipt of your prescription blank.*

SIMILAC—Made from fresh skim milk (casein modified); with added lactose, salts, milk fat and vegetable and cod liver oils.

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Manufacturers of
OXYGEN—NITROUS OXID—ETHYLENE—
CARBON DIOXID—PERCENTAGE MIXTURES
Offices in Most Principal Cities

Continued from page 28

The Jefferson County Medical Society has elected the following officers for 1934: Dr. W. C. Burgess, Ringling, President; and Dr. J. I. Hollingsworth, Waurika, Secretary-Treasurer.

The Muskogee County Medical Society has elected the following officers for 1934: Dr. Charles Edgar White, President; Dr. J. G. Rafter, Vice-President; and Dr. S. D. Neely, Secretary-Treasurer; all of Muskogee.

The Okmulgee County Medical Society has elected the following officers for 1934: Dr. J. G. Edwards, President; Dr. J. C. Matheney, Vice-President; and Dr. M. B. Glismann, Secretary-Treasurer; all of Okmulgee.

The Osage County Medical Society has elected the following officers for 1934: Dr. C. K. Logan, Hominy, President; Dr. D. Worten, Pawhuska, Vice-President; and Dr. M. E. Rust, Pawhuska, Secretary-Treasurer.

The Ottawa County Medical Society has elected the following officers for 1934: Dr. General Pinnell, Miami, President; Dr. J. S. Jacoby, Commerce, First Vice-President; Dr. H. K. Miller, Fairland, Second Vice-President; Dr. Richard Russell, Picher, Third Vice-President; and Dr. J. W. Craig, Miami, Secretary-Treasurer.

The Pittsburg County Medical Society has elected the following officers for 1934: Dr. E. H. Shuller, Oklahoma City, President; and Dr. F. A. Bartheld, Vice-President.

The Pontotoc County Medical Society has elected the following officers for 1934: Dr. M. L. Lewis, President; Dr. M. M. Webster, Vice-President; and Dr. Hervey A. Foerster, Secretary-Treasurer; all of Ada.

The Pushamataha County Medical Society has elected the following officers for 1934: Dr. H. C. Johnson, Antlers, President; Dr. J. Kirkpatrick, Tuskahoma, Vice-President; and Dr. B. M. Huckabay, Antlers, Secretary-Treasurer.

The Stephens County Medical Society has elected the following officers for 1934: Dr. Conner P. Chumley, President; Dr. E. C. Lindley, Vice-President; and Dr. D. Long, reelected Secretary-Treasurer; all of Duncan.

The Tulsa County Medical Society has elected the following officers for 1934: Dr. R. M. Shepard, President-Elect; Dr. Russell Pigford, Vice-President; and Dr. Carl F. Simpson, Secretary-Treasurer; all of Tulsa. Dr. Ned R. Smith, Tulsa, is the incoming President.

The Woodward County Medical Society has elected the following officers for 1934: Dr. H. L. Johnson, Supply, President; Dr. D. W. Darwin, Woodward, Vice-President; and Dr. C. W. Tedrowe, Woodward, Secretary-Treasurer.

### Deaths

Dr. Robert James Barritt, Pawhuska, aged 40, died January 10.

Dr. Thomas Shelby Chapman, McAlester, aged 64, died December 11 of chronic nephritis.

Dr. Andrew Pinkney Brown, Davis, aged 64, died December 13 of cerebral hemorrhage.

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## SOUTH CAROLINA

Dr. J. W. Allen, formerly of New Orleans, Louisiana, has located at Anderson and become associated with Dr. W. H. Nardin, specializing in eye, ear, nose and throat.

The Greenville County Medical Society has elected the following officers for 1934: Dr. W. S. Judy, President; Dr. McNeil Carpenter, Secretary; and Dr. J. W. Jervey, Jr., Treasurer; all of Greenville.

The Columbia County Medical Society has elected the following officers for 1934: Dr. E. L. Horger, President; Dr. H. H. Plowden, Vice-President; and Dr. B. Rubinowitz, Secretary; all of Columbia.

The Greenville Medical Study Club, at a recent meeting, elected the following officers for 1934: Dr. J. McNeil Carpenter, President; Dr. J. G. Murray, Vice-President; and Dr. Mordecai Nachman, Secretary and Treasurer; all of Greenville.

The Medical Society of South Carolina has elected the following officers for 1934: Dr. Francis B. Johnson, President; and Dr. J. J. Ravenel, Vice-President; both of Charleston.

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## TENNESSEE

Dr. W. S. Leathers, Nashville, Dean of the Vanderbilt School of Medicine, delivered the De Lamar Lecture to the faculty and students of Johns Hopkins University, Baltimore, in January.

Dr. Shields Abernathy and Dr. Horace D. Gray, Memphis, have opened the Surgical and Radiological Clinic for the preven-

Continued on page 32

DRYCO
NET WEIGHT 12 OZ.
DRYCO
MADE FROM SUPERIOR QUALITY MILK, FROM WHICH PART OF THE BUTTER FAT HAS BEEN REMOVED, AND THEN DRIED BY THE "JUST" PROCESS.
PARTICULARLY SUITABLE FOR INFANT AND CONVALESCENT FEEDING
IRRADIATED DRYCO PREVENTS RICKETS
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Continued from page 30

tion, study and treatment of cancer, the Clinic being equipped with radium, improved deep therapy and diagnostic x-ray equipment.

Dr. P. E. Parker, Johnson City, announces the reopening of the Elizabeth Gass Memorial Hospital. Dr. Parker will maintain offices in the Hospital, with practice limited to surgery.

The Anderson County Medical Society has elected the following officers for 1934: Dr. J. M. Cox, Coal Creek, President; Dr. Thomas Jennings, Clinton, Vice-President; and Dr. J. S. Hall, Clinton, Secretary-Treasurer.

The Campbell County Medical Society has elected the following officers for 1934: Dr. R. J. Buckman, Westbourne, President; Dr. S. S. Brown, Jellico, Vice-President; and Dr. F. A. McClintock, Newcomb, Secretary-Treasurer.

The Davidson County Medical Society has elected the following officers for 1934: Dr. John M. Lee, President; Dr. W. G. Kennon, Vice-President; and Dr. N. S. Shofner, Secretary-Treasurer; all of Nashville.

The Giles County Medical Society has elected the following officers for 1934: Dr. John Morris, Pulaski, President; Dr. Joe B. Wright, Lynnville, Vice-President; and Dr. T. F. Booth, Pulaski, Secretary-Treasurer.

The Hardin, Lawrence, Lewis, Perry and Wayne Counties Medical Society has elected the following officers for 1934: Dr. J. W. Danley, President; and Dr. C. C. Stockard, Vice-President; both of Lawrenceburg.

The Hickman County Medical Society has elected the following officers for 1934: Dr. L. F. Pritchard, Only, President; Dr. C. V. Stevenson, Centerville, Vice-President; and Dr. W. K. Edwards, Centerville, Secretary-Treasurer.

The Knox County Medical Society has elected the following officers for 1934: Dr. E. A. Guynes, President; Dr. H. T. McClain, Vice-President; and Dr. Jesse C. Hill, Secretary-Treasurer; all of Knoxville.

The Madison County Medical Society has elected the following officers for 1934: Dr. Kelly Smythe, Bemis, President; Dr. Swann Burrus, Jackson, Vice-President; and Dr. S. M. Herron, Jackson, Secretary-Treasurer.

The McMinn County Medical Society has elected the following officers for 1934: Dr. W. R. Arrants, Athens, President; Dr. D. P. Brendle, Englewood, Vice-President; and Dr. R. W. Epperson, Athens, Secretary-Treasurer.

The Putnam County Medical Society has elected the following officers for 1934: Dr. J. T. Moore, Algood, President; Dr. T. M. Crane, Monterey, Vice-President; and Dr. Thurman Shipley, Cookeville, Secretary-Treasurer.

The Rutherford County Medical Society has elected the following officers for 1934: Dr. W. T. Robison, Murfreesboro, President; Dr. J. D. Hall, Readyville, Vice-President; and Dr. J. A. Scott, Murfreesboro, Secretary-Treasurer.

The Memphis and Shelby County Medical Society has elected the following officers for 1934: Dr. J. B. Stanford, President-Elect; Dr. W. L. Rucks, Vice-President; Dr. J. J. Hobson, Treasurer; and Dr. A. F. Cooper, Secretary; all of Memphis. Dr. W. L. Williamson, Memphis, is the incoming President.

The Tipton County Medical Society has elected the following officers for 1934: Dr. G. B. Gillespie, President; and Dr. L. J. Lindsey, Secretary-Treasurer; both of Covington.

The Washington County Medical Society has elected the following officers for 1934: Dr. N. E. Hartsook, President; Dr. W. J. Mathews, Vice-President; and Dr. C. H. Long, Secretary-Treasurer; all of Johnson City.

The White County Medical Society has elected the following officers for 1934: Dr. R. E. Lee Smith, Doyle, President; Dr. E. B. Clark, Sparta, Vice-President; and Dr. A. F. Richards, Sparta, Secretary-Treasurer.

The Wilson County Medical Society has elected the following officers for 1934: Dr. S. B. McFarland, President; Dr. R. L. Witherington, Vice-President; and Dr. J. R. Bone, Secretary-Treasurer; all of Lebanon.

Dr. William A. Runkle, Memphis, and Miss Louise Evelyn Duke were married in January.

### Deaths

Dr. Thomas Pleasant Callicott, Rives, aged 80, died December 21.

Dr. John F. Dismukes, Milton, aged 81, died suddenly December 1.

Dr. James Gustavous Eblen, Lenoir City, aged 65, died January 1 in a Knoxville hospital of sprue.

Dr. Addison R. Boals, Hickory Valley, aged 81, died December 30 of myocarditis following diphtheria.

Dr. George Milton Dorris, Bolivar, aged 79, died December 17 of heart disease.

Continued on page 34


INCRETONE

*Bottles of 6 ounces*

*A Liquid Endocrine Tonic*

with a positive pharmacologic action on the energy liberating mechanism of the body.

Increased energy from increased utilization of the foodstuffs.

G. W. CARNRICK CO. 20 MT. PLEASANT AVE. NEWARK, N. J.

# Klim message of the month

## Your Own Klim Formula *Or* A "Complete Baby Food"

The formulae of the proprietary or "fixed" infant foods do not "fit" all babies even if they are the same age and perfectly healthy. Healthy babies of different ages seem to require or tolerate different percentages of the food elements and *the baby with a digestive disturbance requires a wholly individual adjustment.* Solve your infant feeding problems by using YOUR OWN KLIM FORMULA — each baby is then fed as an individual and on SAFE, PURE, WHOLE POWDERED MILK in accordance with his age and condition.

AUTHORITY: "Thousands of babies are fed by mothers on formulae containing as high as 20 per cent of baby foods which are practically pure carbohydrates. . . . The fault with baby foods lies in the fact that many of them are advertised and used as complete foods without the addition of milk to the formula. Thus there is a lack of fat, protein and vitamins." (Scobey, Ralph R.: Arch. Pediat., Vol. XLVII, No. 6, June, 1930.

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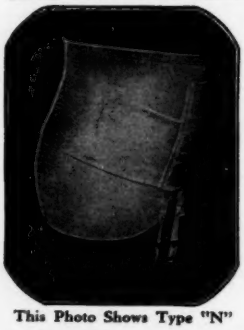

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**KATHERINE L. STORM, M.D.**
**Originator, Owner and Maker**
**1701 Diamond St.** **Philadelphia**

Continued from page 32

Dr. W. W. Widener, Mountain City, aged 62, died suddenly December 23.

Dr. Bart N. White, Murfreesboro, aged 54, died December 19.

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TEXAS

The Texas Ophthalmological and Otolaryngological Society has elected the following officers for 1934: Dr. C. C. Cody, Houston, President; Dr. V. R. Hurst, Longview, First Vice-President; Dr. Dick P. Wall, Galveston, Second Vice-President; Dr. O. M. Marchman, Dallas, Secretary; and Dr. C. P. Schenck, Fort Worth, Treasurer.

The Clay County Medical Society has elected the following officers for 1934: Dr. C. K. Arnold, Petrolia, President; Dr. F. M. Patton, Bluegrove, Vice-President; and Dr. Albert Greer, Henrietta, reelected Secretary-Treasurer.

The Coryell County Medical Society has elected the following officers for 1934: Dr. M. W. Lowrey, President; and Dr. H. R. Jones, Secretary; both of Gatesville.

The El Paso County Medical Society has elected the following officers for 1934: Dr. E. W. Rheinheimer, President; Dr. Ralph Homan, Vice-President; and Dr. Leslie M. Smith, reelected Sscretary-Treasurer; all of El Paso.

The Erath-Hood-Somervell Counties Medical Society has elected the following officers for 1934: Dr. O. O. Gain, Dublin, President; Dr. E. A. Lankford, Stephenville, Vice-President; and Dr. T. F. Bryan, Dublin, Secretary.

The Falls County Medical Society has elected the following officers for 1934: Dr. G. H. Hampshire, Marlin, President; Dr. H. P. Curry, Reagan, Vice-President; and Dr. C. F. Miller, Secretary.

The Galveston County Medical Society has elected the following officers for 1934: Dr. W. F. Spiller, Galveston, President; Dr. E. M. F. Stephen, Galveston, Vice-President; and Dr. B. R. Parrish, San Angelo, reelected Secretary-Treasurer.

The Hamilton County Medical Society has elected the following officers for 1934: Dr. W. A. Snodgrass, Hamilton, President; Dr. C. M. Hall, Hico, Vice-President; and Dr. D. B. Beach, Hamilton, Secretary-Treasurer.

The Henderson County Medical Society has elected the following officers for 1934: Dr. P. T. Kilman, Malakoff, reelected President; Dr. N. D. Geddie, Athens, Vice-President; and Dr. A. H. Easterling, Athens, reelected Secretary-Treasurer.

The Hunt County Medical Society has elected the following officers for 1934: Dr. J. L. Austin, Rockwall, President; Dr. P. W. Pearson, Emory, First Vice-President; Dr. S. D. Cooper, Wolfe City, Second Vice-President; Dr. W. R. Cate, Commerce, Third Vice-President; and Dr. T. C. Strickland, Greenville, Secretary-Treasurer.

The Hutchinson County Medical Society has elected the following officers for 1934: Dr. J. H. Walker, President; Dr. W. G. Stephens, Vice-President; and Dr. L. H. Martin, Secretary-Treasurer; all of Borger.

The Jefferson County Medical Society has elected the following officers for 1934: Dr. L. C. Heare, Port Arthur, President; Dr. L. C. Powell, Beaumont, Vice-President; and Dr. Roland B. Carroll, Port Arthur, Secretary-Treasurer.

The Kaufman County Medical Society has elected the following officers for 1934: Dr. J. W. H. Belote, Elmo, President; Dr. D. T. Friddell, Terrell, Vice-President; and Dr. D. H. Hudgins, Forney, reelected Secretary-Treasurer.

The Lavaca County Medical Society has elected the following officers for 1934: Dr. Charles Kopecky, Yoakum, President; Dr. Harvey Renger, Hallettsville, Vice-President; and Dr. W. J. Gray, Yoakum, Secretary-Treasurer.

The Mason-Menard-McCulloch Counties Medical Society has elected the following officers for 1934: Dr. G. H. Ricks, Brady, President; Dr. William Land, Lohn, Vice-President; and Dr. G. G. McCollum, Mason, reelected Secretary-Treasurer.

The Palo Pinto County Medical Society has elected the following officers for 1934: Dr. W. B. Lasater, President; Dr. William S. Baldwin, Vice-President; and Dr. G. T. L. Bryan, Secretary-Treasurer; all of Mineral Wells.

The Tarrant County Medical Society has elected the following officers for 1934: Dr. W. S. Horn, President-Elect; Dr. L. O. Godley, Vice-President; and Dr. Craig Munter, reelected Secretary-Treasurer; all of Fort Worth.

Dr. Charles S. Venable and Mrs. Eleanor Herff Johnson, both of San Antonio, were married recently.

Dr. Nathan Judson Bender, Poteet, and Miss Lorelle Causey were married recently.

DEATHS

Dr. Alcinous Smyth, Kingsville, aged 82, died November 23.

Dr. Robert Lee Raby, Gatesville, aged 65, died November 19.

Continued on page 36

WHEN you prescribe S.M.A. for a normal infant deprived of breast milk you do so with the assurance that the chances are 10 to 1 that the child will do unusually well on it.

S.M.A. produces *excellent* nutritional results in most cases, and produces these results more simply and more quickly; and there is a wealth of clinical evidence to back that claim.

## Physicians Report Results

As one example of this, take the following answers to a questionnaire sent to a representative group of physicians early in our work:

*Q.—Have the average results obtained by you in feeding S.M.A. been excellent, good, fair or poor?*

A.—Excellent, 74.2%
Good, 25.8%
Fair, 0%
Poor, 0%

*Q.—Do you feel that S.M.A. is of value to you in your practice from the standpoint of preventing nutritional diseases?*

A.—Yes, 97.1%
Undecided, 2.9%

*Q.—Has the feeding with S.M.A. been easier and less annoying than with other foods or mixtures used by you heretofore?*

A.—Yes, 100%

*Q.—Have your nutritional results been better than with other foods or mixtures used by you heretofore?*

A.—Yes, 83%
No, 14.6%
Undecided, 2.4%

If you are interested in saving yourself exacting detail in infant feeding, and want to be assured of excellent results in most cases, you can do no better than prescribe S.M.A., the formula prepared with laboratory exactness for infants deprived of breast milk.

## S.M.A. Ahead in 1915; Still Far Ahead

S.M.A. has been antirachitic from its beginning in 1915. S. M. A. was a revolutionary departure then, was far ahead in 1921 when it was offered to the profession generally, and is still far ahead in numerous unheralded ways, some of which are:

1. Buffer value is practically identical with breast milk.
2. Fat has the same Reichert - Meissl number, Iodine number, Polenske number, Saponification number, melting point and refractive index as breast milk fat.
3. The pH is the same as breast milk.
4. Electrical conductivity is the same as breast milk.
5. Freezing point is the same as breast milk.
6. Osmotic pressure is the same as breast milk.
7. Curds produced by the action of the gastric juices on S.M.A. are soft and practically the same as breast milk.
8. Stools are acid and also physically similar to those of breast fed infants.

## S. M. A. is the Antirachitic Breast Milk Adaptation

***S.M.A. is a food for infants—derived from tuberculin tested cows' milk, the fat of which is replaced by animal and vegetable fats including biologically tested cod liver oil; with the addition of milk sugar potassium chloride and salts; altogether forming an antirachitic food. When diluted according to directions, it is essentially similar to human milk in percentages of protein, fat, carbohydrates and ash, in chemical constants of the fat and in physical properties.***

**Try S. M. A. in your own practice.** For samples simply attach this paragraph to your letterhead. S. M. A. Corporation, 4614 Prospect Ave., Cleveland, O.

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**S. M. A. PRODUCES RESULTS, MORE SIMPLY AND MORE QUICKLY**

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Continued from page 34

Dr. William Thomas Dawe, Gonzales, aged 59, died November 27 of sarcoma of the liver.

Dr. Herbert Battles Tanner, Eastland, aged 74, died December 4 of tuberculous pleurisy.

Dr. Fred A. Collins, Vega, aged 67, died December 1 of diabetes mellitus and myocarditis.

Dr. Robert Lee Clayton, Celina, aged 70, died December 1 of heart disease.

Dr. T. C. McCloud, Graham, aged 48, died December 21 of a skull fracture received in an automobile accident.

## VIRGINIA

Dr. Stuart McGuire, Richmond, was honored recently with a testimonial dinner given him by the faculty of the Medical College of Virginia, in recognition of forty years of continuous service to the College. Dr. McGuire is at this time Chairman of the Executive Committee of its Board of Visitors. The dinner was presided over by Dr. Roshier W. Miller, who has also had forty years of continuous connection with the institution.

Dr. Southgate Leigh, Norfolk, was honored at a recent meeting of the Norfolk County Medical Society by having the title of Honorary Member conferred upon him by the Society in recognition of his services in the cause of organized medicine through his connection and interest of many years' standing in the local, state and national associations.

Work was begun in January on the new veterans' hospital at Roanoke. Ceremonies were held marking the breaking of ground for the foundation of the building.

The Gill Memorial Eye, Ear and Throat Hospital, Roanoke, will hold its eighth annual Spring Graduate Course in April at the Hospital.

Dr. Bruce L. Randolph, Richmond, is the newly appointed physician to the Virginia Electric and Power Company Employees' Association. Dr. Randolph succeeds Dr. H. A. Bullock, deceased.

The "MESCO" Laboratories manufacture the largest line of Ointments in the world. Sixty different kinds. We are originators of the Professional Package. Specify "MESCO" when prescribing ointments. Send for lists.

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ALCOHOLISM (30 years' experience)—THE STOKES HOSPITAL, 923 Cherokee Road, Louisville, Kentucky. Telephone, East 1488. $150.00 up for four weeks' treatment. Absolute privacy. Treatment one of gradual reduction. Do not limit the quantity of whiskey used in treatment. Each patient treated as an individual case. Craving for alcoholic beverages destroyed; no physical injury incurred.

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ASSISTANCE OFFERED TO MEDICAL WRITERS. Research. Abstracts. Translations (all languages). Papers prepared from author's data. Ten years' experience with leading physicians and appointments on medical journals of highest standing. I employ no assistants; all my work is done personally and is reliable. Florence Annan Carpenter, 413 St. James Place, Chicago, Ill.

Dr. T. S. Jennings has moved from Richmond, where he was connected with the medical staff at Pine Camp Hospital, to Waverly, where he will engage in general practice.

Dr. William R. Jordan has located at Richmond with offices in the Medical Arts Building, where he will limit his practice to the treatment of diabetic patients.

Dr. Euclid Neal has moved from Big Island to Bedford.

Dr. Thomas G. Hardy, Farmville, was recently made a Fellow of the American College of Surgeons.

Dr. J. K. Hall, Richmond, was recently appointed a member of the Committee on Ethics of the American Psychiatric Association.

Dr. Charles W. Putney, formerly of Staunton, has located at Richmond, with offices in the West End Medical Building, practice limited to general surgery.

The Tri-State Medical Association of the Carolinas and Virginia met in Charlottesville in February for its annual session.

The Accomack Medical Society has elected the following officers for 1934: Dr. A. F. Wood, Parksley, President; Dr. J. Fred Edmonds, Accomack Courthouse, Vice-President; and Dr. John W. Roberason, Onancock, reelected Secretary-Treasurer.

The Albemarle County Medical Society has elected the following officers for 1934: Dr. C. Bruce Morton, President; Dr. E. W. Burton, Vice-President; and Dr. Kenneth F. Maxcy, reelected Secretary-Treasurer; all of University.

The Alexandria Medical Society has elected the following officers for 1934: Dr. S. B. Moore, President; Dr. H. A. Hornthal, Vice-President; and Dr. W. E. Beattie, reelected Secretary-Treasurer; all of Alexandria.

Election of officers for the Children's Memorial Clinic, Richmond, resulted as follows: Dr. Lee F. Sutton was reelected President; Dr. Ramon Garcin reelected Vice-President; and Dr. St. George Grinnan reelected to the Board. Dr. Howard Masters was elected a new member of the Board.

Dr. Roy C. Fravel, Woodstock, and Miss Adelaide Rebecca Smith were married recently.

Dr. William Moir, University, and Miss Jane Neave Hildreth were married recently.

### DEATHS

Dr. Sydney Sheppard Kellam, Belle Haven, aged 59, died suddenly December 12 of angina pectoris.

Dr. Allan Moore Kimbrough, Norfolk, aged 37, died January 15 following a heart attack.

Dr. Edwin Lawrence Kendig, Victoria, aged 52, died January 15 of heart disease complicated by rheumatic fever.

## WEST VIRGINIA

The Barbour-Randolph-Tucker County Medical Society has elected the following officers for 1934: Dr. W. S. Michaels, Junior, President; Dr. S. J. Skar, Davis, Dr. C. H. Hall, Elkins, Vice-Presidents; and Dr. Russell Wolfe, Elkins, reelected Secretary-Treasurer.

The Fayette County Medical Society has elected the following officers for 1934: Dr. W. P. Bittinger, Summerlee, President; Dr. P. E. Prillman, Oak Hill, First Vice-President; Dr. J. P. Van Pelt, Oak Hill, Second Vice-President; and Dr. Ralph Hogshead, Montgomery, Secretary-Treasurer.

The Grant, Hardy, Hampshire, Mineral County Medical Society has elected the following officers for 1934: Dr. W. M. Babb, Keyser, President; Dr. J. P. Groves, Petersburg, Dr. Harry Rollings, Wardensville, Dr. James T. Daily, Romney, Dr. James T. Wolverton, Piedmont, Dr. J. B. Johnston, Franklin, Vice-Presidents; and Dr. T. C. Griffin, Keyser, reelected Secretary-Treasurer.

The Greenbrier Valley Medical Society has elected the following officers for 1934: Dr. Robert E. Baer, White Sulphur Springs, President; and Dr. A. C. Lanham, Ronceverte, Secretary-Treasurer.

The Kanawha County Medical Society has elected the following officers for 1934: Dr. John W. Moore, President; Dr. O. H. Bobbitt, Vice-President; and Dr. E. Andrew Amick, Secretary-Treasurer; all of Charleston.

The Monongalia County Medical Society has elected the following officers for 1934: Dr. B. M. Stout, President; and Dr. G. R. Maxwell, reelected Secretary-Treasurer; both of Morgantown.

The Parkersburg Academy of Medicine has elected the following officers for 1934: Dr. E. W. Crooks, President; Dr. H. A. Giltner, Vice-President; and Dr. Welch England, Secretary-Treasurer; all of Parkersburg.

Dr. T. R. Boling, formerly connected with Rutherford Sanitarium, at Beckley, has recently located at Grantsville for general practice.

### DEATHS

Dr. Luther H. Clark, Kyle, aged 63, died suddenly December 23 of cerebral hemorrhage.

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GETTING up an hour earlier in the morning is an inconvenience for most persons, but for the mother of young babies it is a hardship, sometimes almost tragic, frequently nullifying the best-planned pediatric advice.

This is especially true in the case of the nursing mother whose supply and quality of breast milk are affected by emotional shocks resulting often in agalactia and sometimes giving rise in the baby to diarrhea, colic, and even convulsions. Furthermore, the mother's emotional stress brings about a train of behavior on her part which is reflected in the child's psychologic reactions so that a vicious circle of bad habit formation is set up.

From this angle, the recent introduction of the pre-cooked form of Mead's Cereal, known as Pablum, assumes new importance in the doctor's psychological handling of both mother and child, quite aside from its nutritional value.*

Because Pablum can be prepared in a minute, the mother can sleep the extra hour she would otherwise be compelled to spend in a hot kitchen cooking cereal. Added rest means better poise, so that petty annoyances do not bring jaded nerves. Prompt feedings prevent many childhood tantrums, and a satisfied baby usually eats better and enjoys better digestion and growth.

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# Dextri-Maltose, Carbohydrate of Choice

"As to the kind of extra carbohydrate to be added, whether lactose or maltose, I believe dextri-maltose to be better in general in cases of fat indigestion (infantile atrophy)."—*C. H. Dunn: The Hygienic and Medical Treatment of Children, Southworth Co., Troy, New York, 1917, V. 1, p. 418.*

In discussing the treatment of decomposition Feer says: "The period of repair may be shortened by giving suitable additional food; the best, probably, being buttermilk to which carefully regulated proportions of dextrin and maltose preparations or malt soup are added."—*E. Feer: Text-Book of Pediatrics, J. B. Lippincott Co., Phila., 1922, p. 284.*

In the treatment of infantile atrophy Fischer recommends the following: "The carbohydrate should be increased by gradual addition of dextri-maltose.

"Malt soup or dextrimaltose (Mead's) should be added in teaspoonful or more doses to each feeding until the point of carbohydrate tolerance is reached."—*L. Fischer: Diseases of Infancy and Childhood, F. A. Davis Co., Phila., 1925, V. 1, p. 285.*

Concerning the treatment in the case of a premature infant Fischer states: "Dried milk with water was given, which later was changed to whole milk, 14 ounces; water, seven ounces, and dextri-maltose No. 1, one and one-half ounces. Seven feedings of three ounces each every three hours was given. The above feeding was retained. The infant gained eight ounces at the end of the first week."—*L. Fischer: Clinical notes in a series of premature infants, Arch. Pediat. 44:227-231, April, 1927.*

Grulee, in discussing the treatment of decomposition, says: "As a rule it is best to start with 2 to 2½ or 3 ounces of albumin milk to the pound weight in 24 hours; the sugar to be added is in the form of a maltose-dextrin mixture. One should never delay too long in adding this."—*C. G. Grulee: Infant Feeding, W. B. Saunders Co., Phila., 1922, p. 265.*

Referring to the hypotrophic infant Herrman writes: "In mild cases, the addition of dextrimaltose instead of cane or milk sugar may be sufficient to obtain a gain in weight."—*C. Herrman: The treatment of nutritional disorders in artificially-fed infants, New York M. J. 114:158-160, August, 1921.*

In discussing artificial feeding in athrepsia Hess states: "The carbohydrates are usually added in a slowly fermentable form, such as the maltose and dextrin compounds, which are usually started by the addition of four grams per kilogram (1/15 ounce per pound) and increased until eight grams or more per kilogram (¼ ounce per pound) of body weight are added."—*J. H. Hess: Feeding and the Nutritional Disorders in Infancy and Childhood, F. A. Davis Co., Phila., 1928, p. 278.*

Concerning the treatment of marasmus Hill says: "When the stools have become smooth and salve-like, carbohydrate, in the form of dextrimaltose, may be gradually added up to the limit of tolerance."—*L. W. Hill: Practical Infant Feeding, W. B. Saunders Co., Phila., 1922, p. 281.*

"A spasmophilic baby on bottle feeding should receive a limited amount of milk—a pint, or at the most 24 ounces in the 24 hours—to which cereal gruel and some form of sugar is added, preferably one of the malt dextrin preparations; also the early addition of other foods than milk to the baby's diet."—*M. Jampolis: Infantile spasmophilia, Interstate M. J. 25:652, Sept., 1918; abst. Arch. Pediat. 35:691, Nov. 1918.*

With reference to the treatment of diarrhea Lust writes: "After several days, 2% to 3% of a maltose-dextrin preparation may be added (Dextri-Maltose). This is preferable to the easily fermentable lactose or cane sugar."—*F. Lust: The Treatment of Children's Diseases, J. P. Lippincott Co., Phila., 1930, p. 145.*

"The treatment of artificially fed children in the first of these groups consists in putting them on a low fat dietary, and giving them carbohydrate in the form of one of the less fermentable sugars—e.g., dextrimaltose."—*L. G. Parsons: Wasting disorders of early infancy, Lancet, 1:687-694, April 5, 1924.*

Pearson and Wyllie in discussing the treatment of milder cases of inanition say: "Regulation of this disturbed organismal balance is obtained by the addition of carbohydrates, while fat and casein are reduced. For this purpose dextrimaltose and flour are better than the ordinary sugars, since they are more slowly absorbed and have greater efficacy in their powers of controlling the flora in the large intestine."—*W. J. Pearson, and W. G. Wyllie: Recent Advances in Diseases of Children, P. Blakiston's Son & Co., Phila., 1930, p. 116.*

Regarding the treatment of the marantic infant Rauc states: "After the intolerance to sugar has been overcome a carbohydrate, preferably Dextri-maltose, may be added."—*C. S. Raue: Diseases of Children, Bouricks & Tafel, Phila., 1922, p. 427.*

In discussing the treatment of atrophy Thurafield and Paterson, state: "If the baby continues to improve, the next step in the treatment is to add to the milk one of the less fermentable carbohydrates, such as dextrimaltose . . . —*H. Thurafield and D. Paterson: Diseases of Children, William Wood & Co., 1923, p. 105.*

"I also find dextrin-maltose an excellent addition to albumin-milk when the first object of that food has been achieved and a gain in weight is desired; in this way I have succeeded in feeding albumin-milk far beyond the period usually advised, with highly gratifying results."—*F. L. Wachenheim: Infant-Feeding; Its Principles and Practice, Lea & Febiger, Phila., 1915, p. 156.*

"Dextri-maltose has been substituted for lactose not infrequently, when the tolerance for the latter continues low."—*I. H. West: Low fat, high starch evaporated milk feeding for the marasmic baby, Arch. Pediat. 48:189-193, March, 1931.*

"Malt sugar is indicated when others fail to produce a sufficient gain, or when malassimilation of fat is evident."—*O. H. Wilson: The role of carbohydrates in infant feeding, Southern M. J. 11:177, March, 1918; abst. Arch. Pediat. 35:447, July, 1918.*

## Significance of the Mead Policy

**WHEN Dextri-Maltose was marketed in 1911, "without dosage directions on the package," Mead Johnson & Company pioneered the principle that infant feeding was a therapeutic problem. Up to that time far more babies were fed by grandmothers, neighbors, grocers, and commercial houses than by physicians. This Mead Policy was not readily accepted in the beginning, and it took many years of unceasing effort before the weight of the majority medical opinion finally led to mandatory action on the part of the Committee on Foods in 1932 whereby all makers of baby foods are now OBLIGED to omit dosage directions. The Mead Policy, however, does not stop here. It embraces other principles with which all physicians interested in the private practice of medicine are in agreement, such as (2) No descriptive circulars in packages, or in shipping cartons (for druggists to hand to patients). (3) We supply no display of Mead products for druggists' windows and counters. (4) We do not advertise Mead products to patients. (5) We give no handbills and send no letters to patients concerning Mead products. (6) We do not broadcast to the public. (7) We refer patients to physicians at every opportunity. (8) We devote a great deal of effort and resources to research and to activities that assist the private practice of medicine. *When requesting samples of Dextri-Maltose, please enclose professional card to cooperate in preventing their reaching unauthorized persons.***

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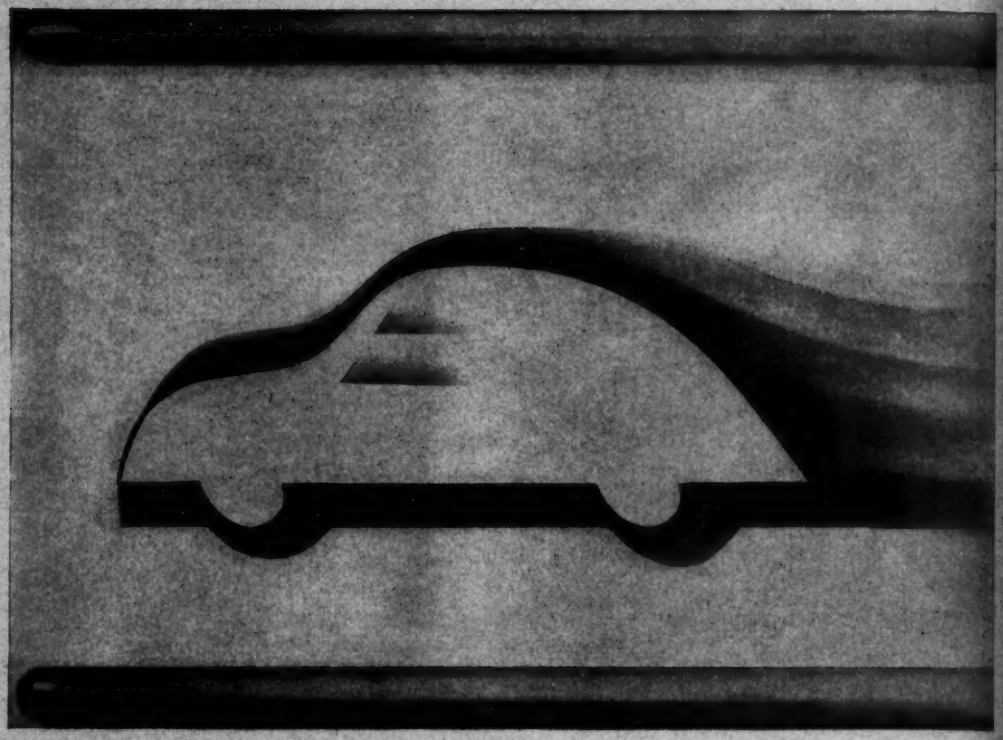

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